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(54) **ENHANCED STATE MANAGER IN A VIRTUAL AI REPRESENTATIVE**

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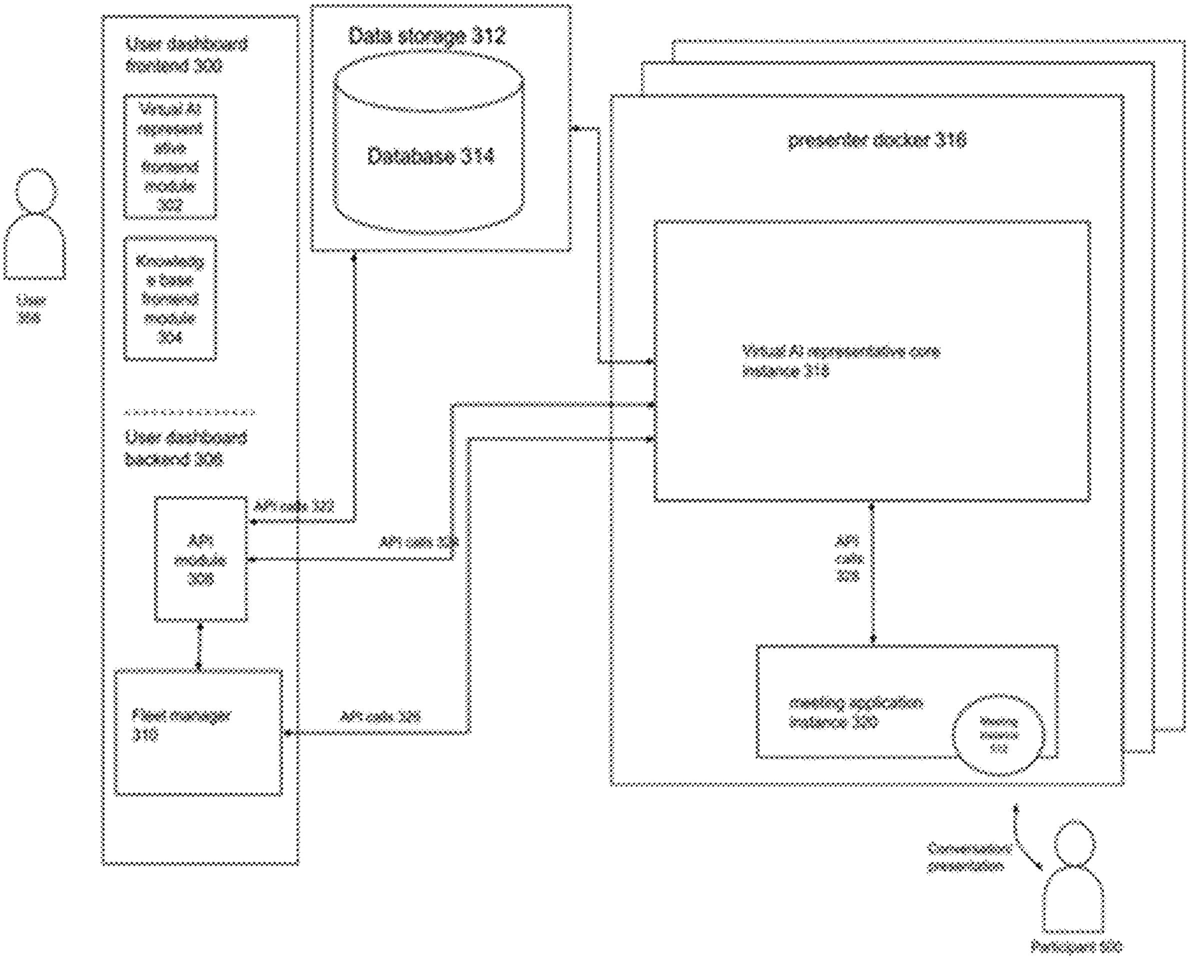
CPC ........ ***G06F 16/33295*** (2025.01); ***H04L 51/02*** (2013.01)

(57) **ABSTRACT**

Disclosed is an approach for transitioning between a main topic state and a tangential topic state in a virtual artificially intelligent (AI) system. A state machine controlling a directed conversation is received by the AI system. A knowledge base is ingested for the directed conversation by the AI system. A first input from a user is processed by the AI system which causes the AI system to enter a first state related to a first topic. Responsive to receiving a second input, by the AI system from the user not related to the first topic transitioning, by the AI system, into a tangential topic state.



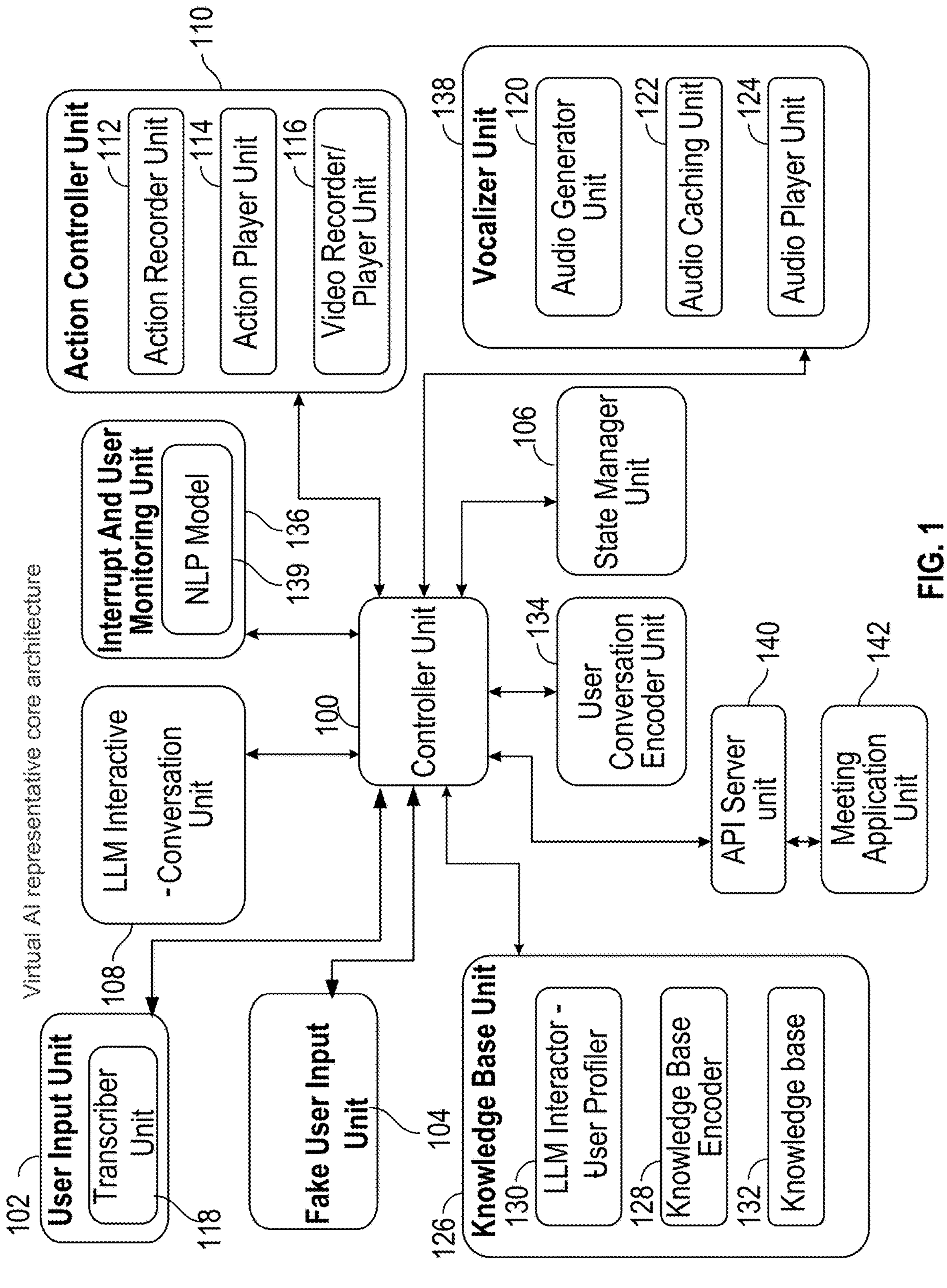

Virtual AI representative core architecture
Action Controller Unit
110
112
Action Recorder Unit
114
Action Player Unit
116
Video Recorder/ Player Unit
Vocalizer Unit
138
120
Audio Generator Unit
122
Audio Caching Unit
124
Audio Player Unit
Interrupt And User Monitoring Unit
NLP Model
139
136
State Manager Unit
106
LLM Interactive -Conversation Unit
108
100
Controller Unit
134
User Conversation Encoder Unit
API Server unit
140
Meeting Application Unit
142
User Input Unit
102
Transcriber Unit
118
Fake User Input Unit
104
Knowledge Base Unit
126
130
LLM Interactor - User Profiler
128
Knowledge Base Encoder
132
Knowledge base

FIG. 1

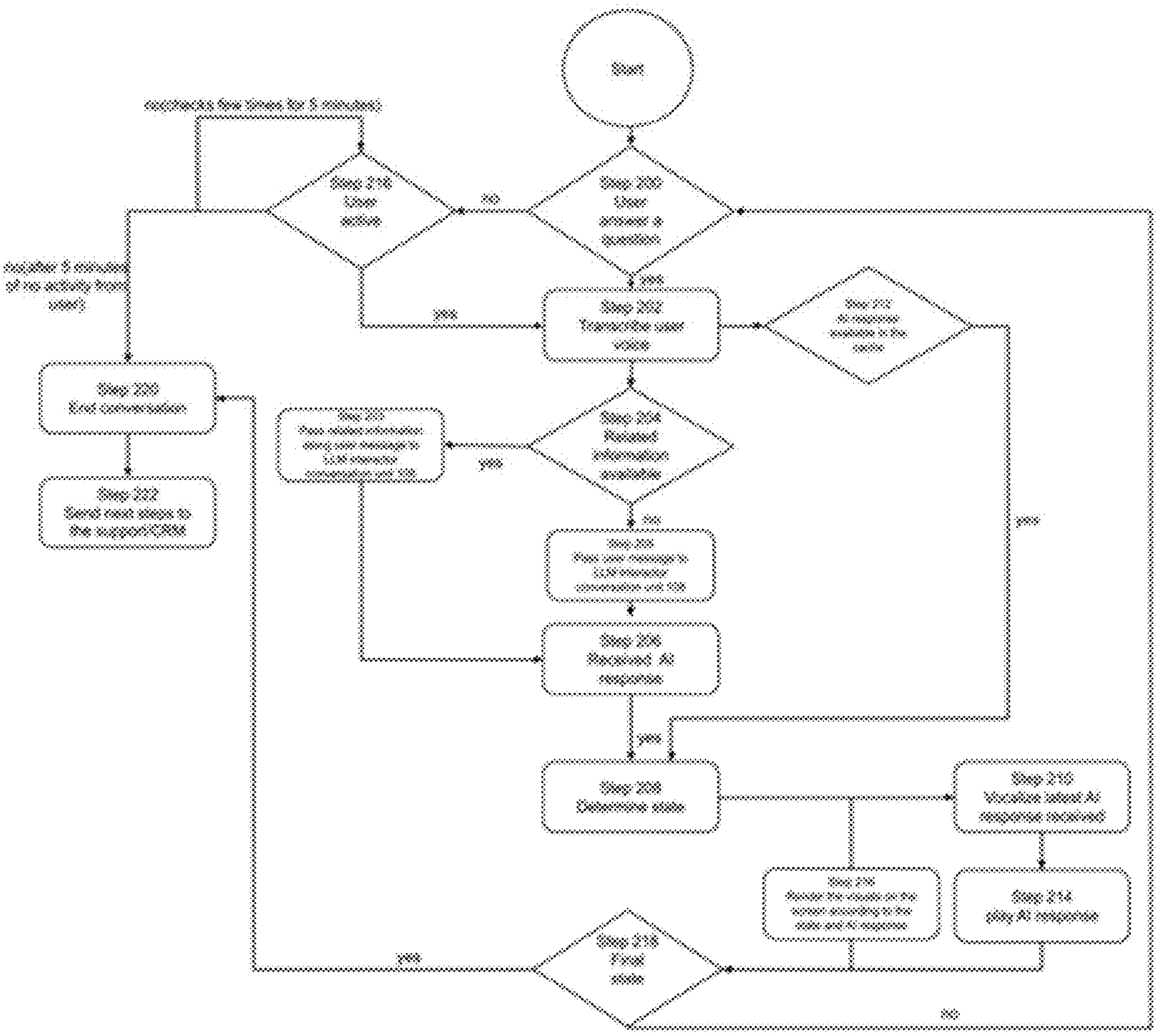

Start
reattempts few times for 5 minutes
Step 218
User
active
no
Step 200
User
answer a
question
no(after 5 minutes
of no activity from
user)
yes
yes
Step 202
Transcribe user
voice
Step 2??
AI response
available in the
cache
Step 220
End conversation
Step 222
Send next steps to
the support/CRM
Step 2??
Pass relevant information
along user message to
LLM character
conversation and TTS
yes
Step 204
Related
information
available
no
Step 2??
Pass user message to
LLM character
conversation and TTS
yes
Step 206
Received AI
response
yes
Step 208
Determine state
Step 210
Visualize latest AI
response received
Step 212
Rotate the visuals on the
screen according to the
state and AI response
Step 214
play AI response
yes
Step 216
Final
state
no

FIG. 2

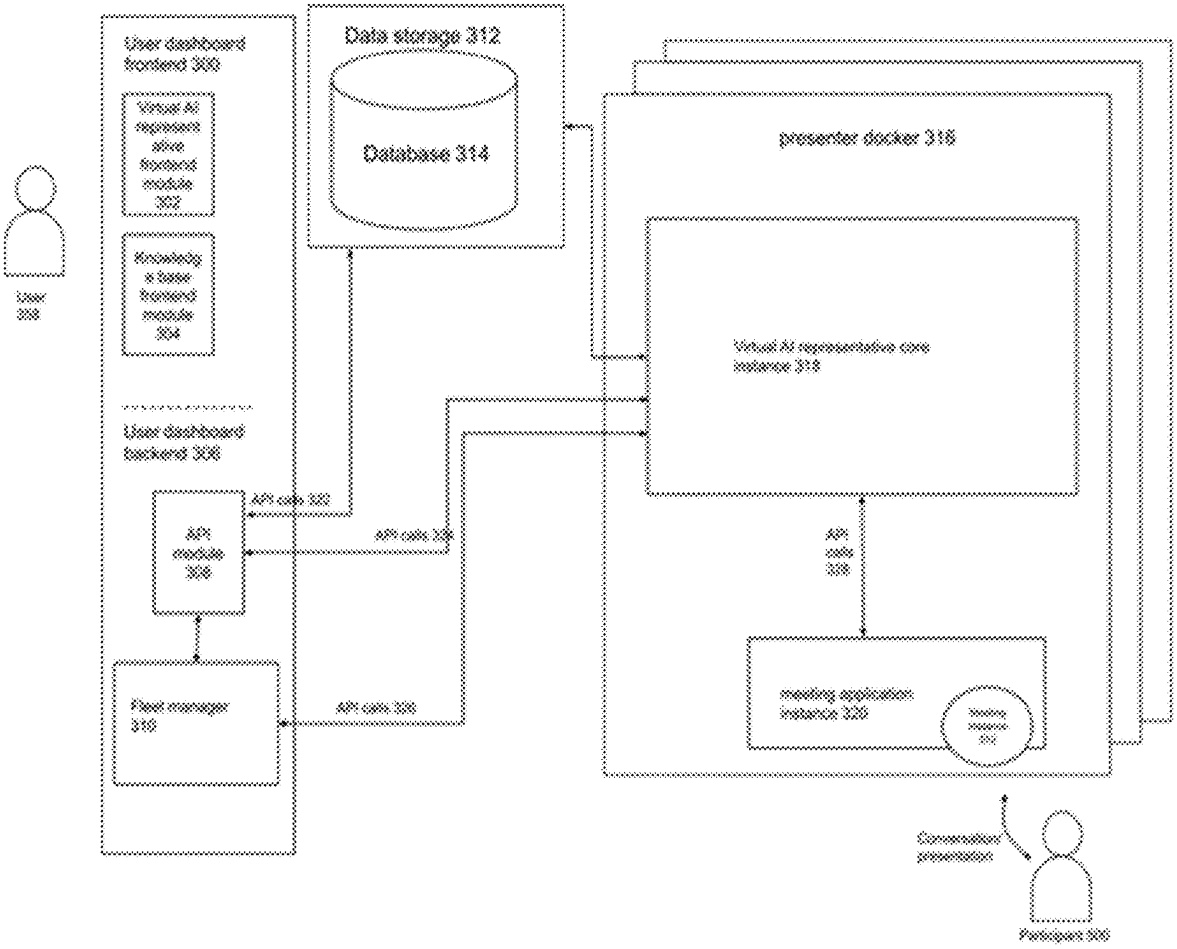
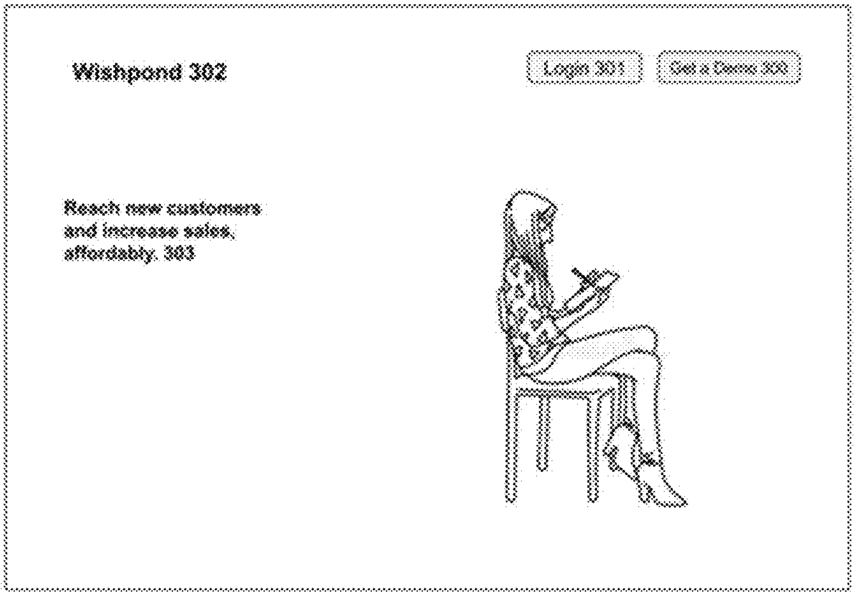

User dashboard frontend 300
Virtual AI representative frontend module 302
Knowledge base frontend module 304
User dashboard backend 306
API module 308
Fleet manager 310
Data storage 312
Database 314
presenter docker 316
Virtual AI representative core instance 318
API calls 322
API calls 324
API calls 326
API calls 328
meeting application instance 330
User
Conversation/presentation
Participant

FIG. 3

illustrates a hypothetical website that employs a virtual AI representative to present the product to interested participants.



Reach new customers and increase sales, affordably. 303

FIG. 4

Participant request a virtual AI presentation session

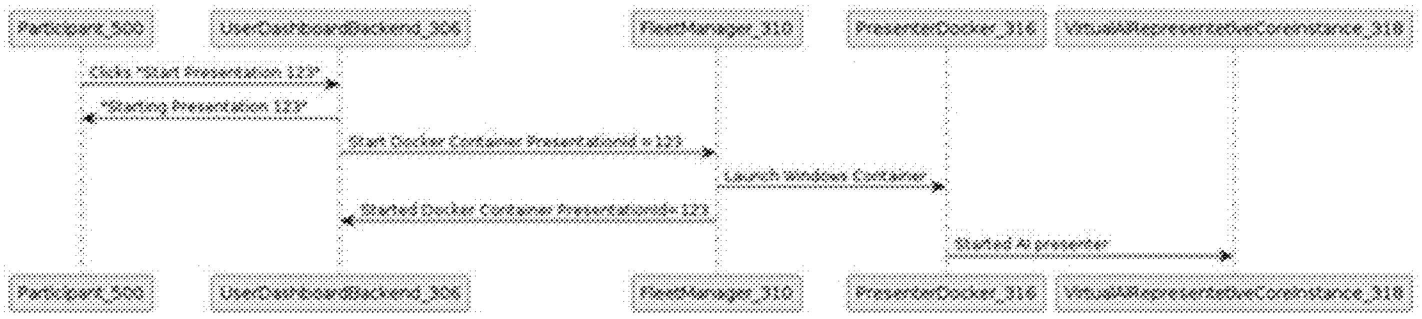

Participant_300
UserDashboardBackend_306
FleetManager_310
PresenterDocker_316
VirtualAIRepresentativeCoreInstance_318
Clicks "Start Presentation 123"
"Starting Presentation 123"
Start Docker Container PresentationId = 123
Launch Windows Container
Started Docker Container PresentationId= 123
Started AI presenter
Participant_300
UserDashboardBackend_306
FleetManager_310
PresenterDocker_316
VirtualAIRepresentativeCoreInstance_318

FIG. 5

Participant Joins Meeting Session

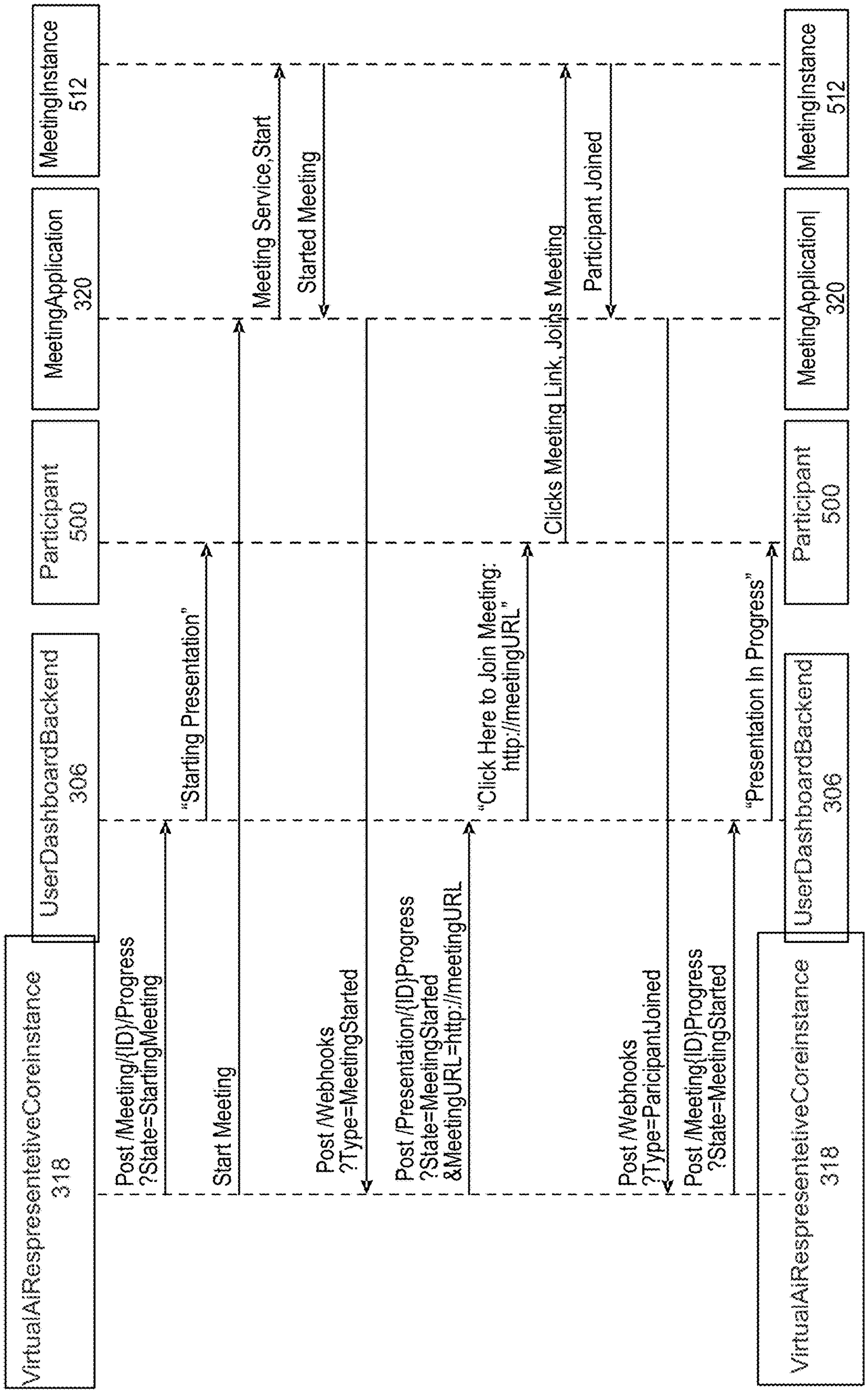


FIG. 6

Virtual AI presentation begins meeting session

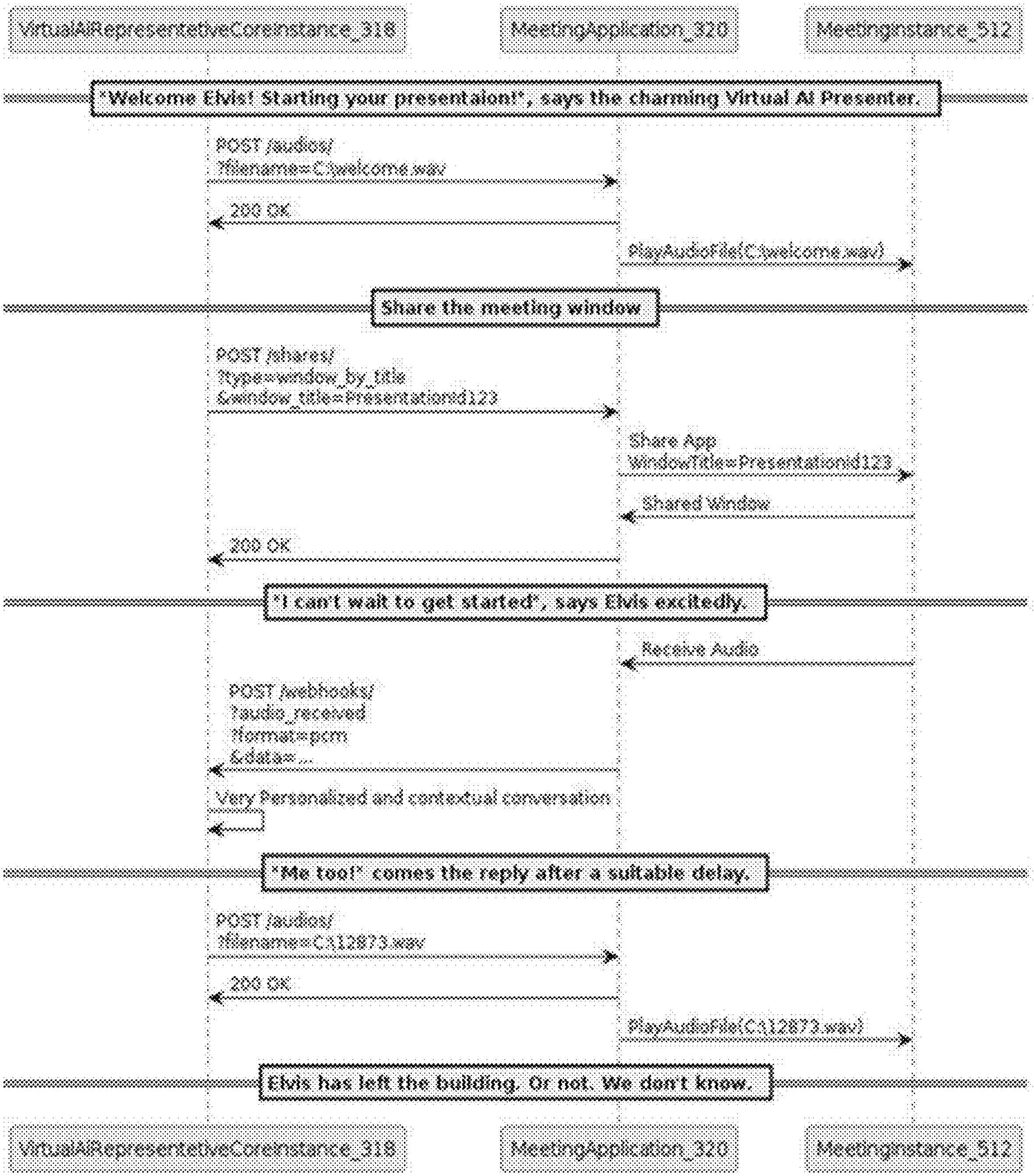

VirtualAiRepresentetiveCoreInstance_318
MeetingApplication_320
MeetingInstance_512
"Welcome Elvis! Starting your presentaion!", says the charming Virtual AI Presenter.
POST /audios/
?filename=C:\welcome.wav
200 OK
PlayAudioFile(C:\welcome.wav)
Share the meeting window
POST /shares/
?type=window_by_title
&window_title=PresentationId123
Share App
WindowTitle=PresentationId123
Shared Window
200 OK
"I can't wait to get started", says Elvis excitedly.
Receive Audio
POST /webhooks/
?audio_received
?format=pcm
&data=...
Very Personalized and contextual conversation
"Me too!" comes the reply after a suitable delay.
POST /audios/
?filename=C:\12873.wav
200 OK
PlayAudioFile(C:\12873.wav)
Elvis has left the building. Or not. We don't know.
VirtualAiRepresentetiveCoreInstance_318
MeetingApplication_320
MeetingInstance_512

FIG. 7

User dashboard to define the virtual AI presenter specifications

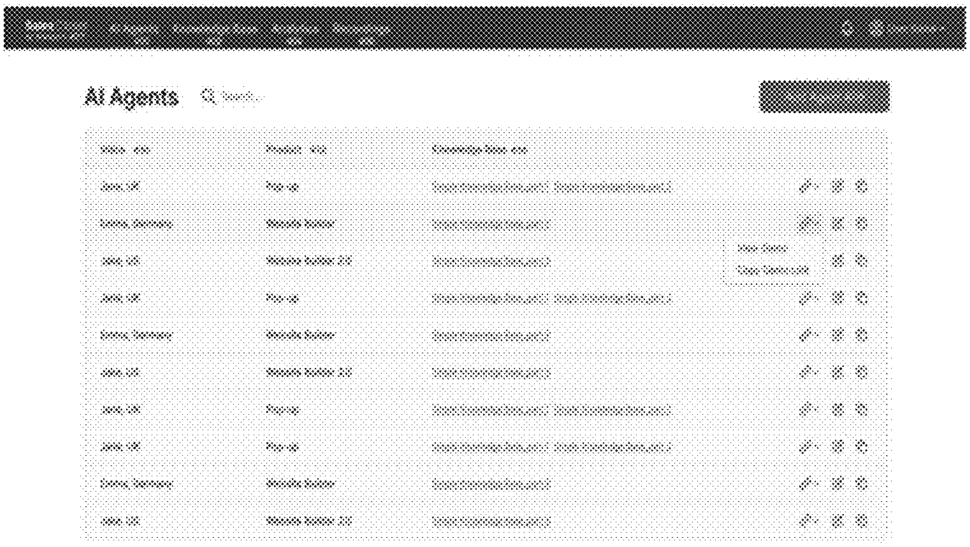


FIG. 8

Hardware architecture required to implement the present invention.

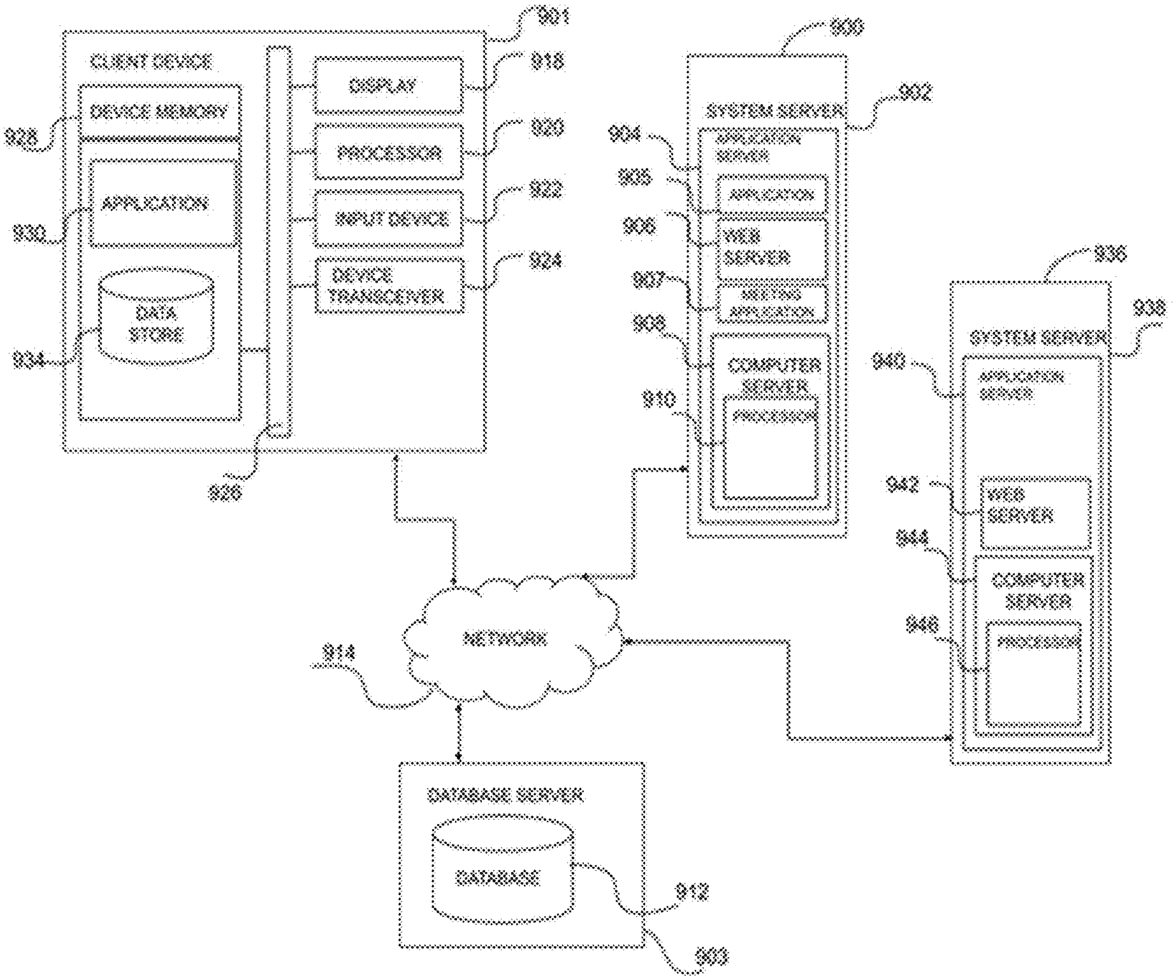


*FIG. 9*

User dashboard to build a sequence of primary and contingent states to guide the conversation

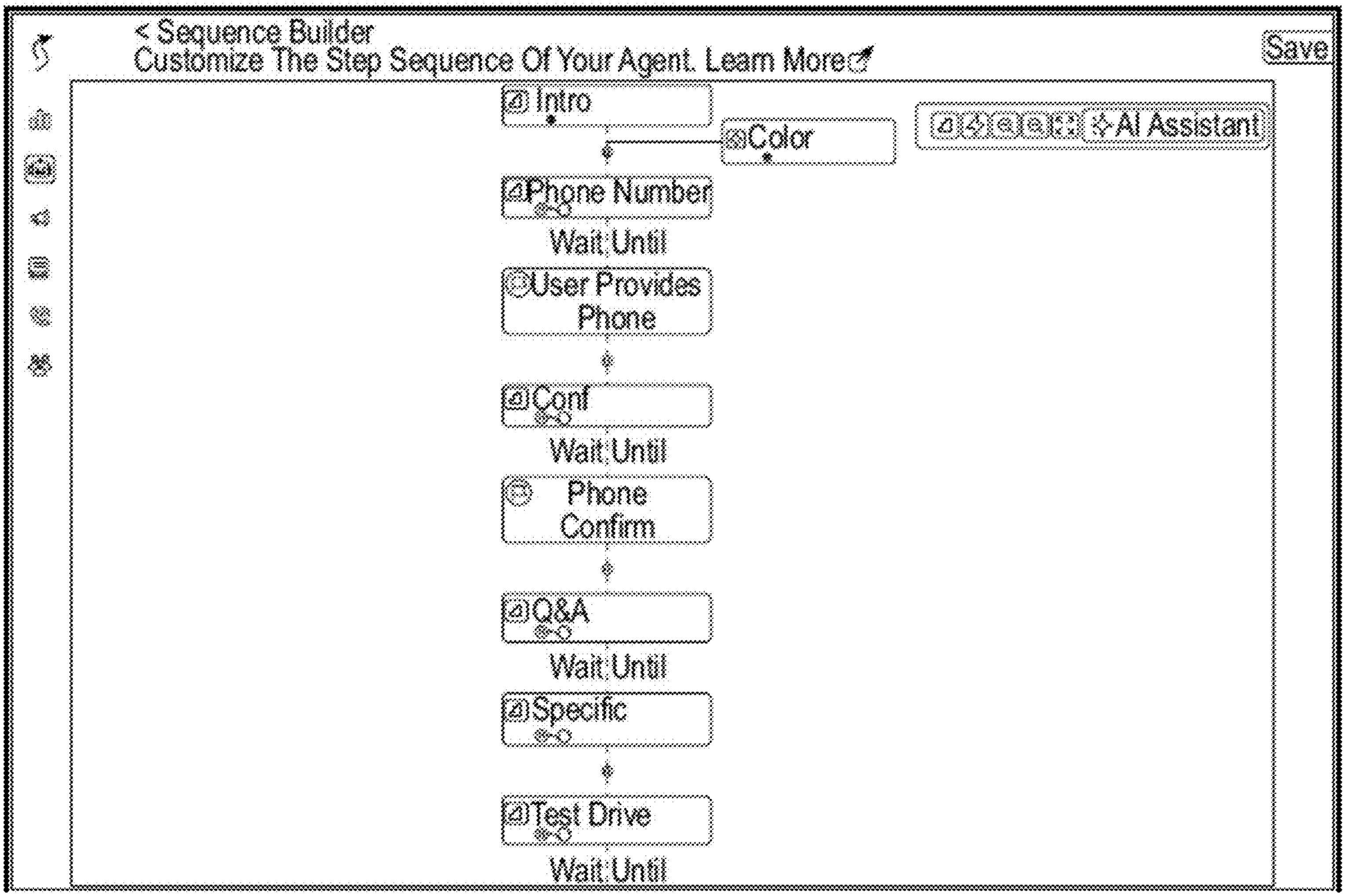
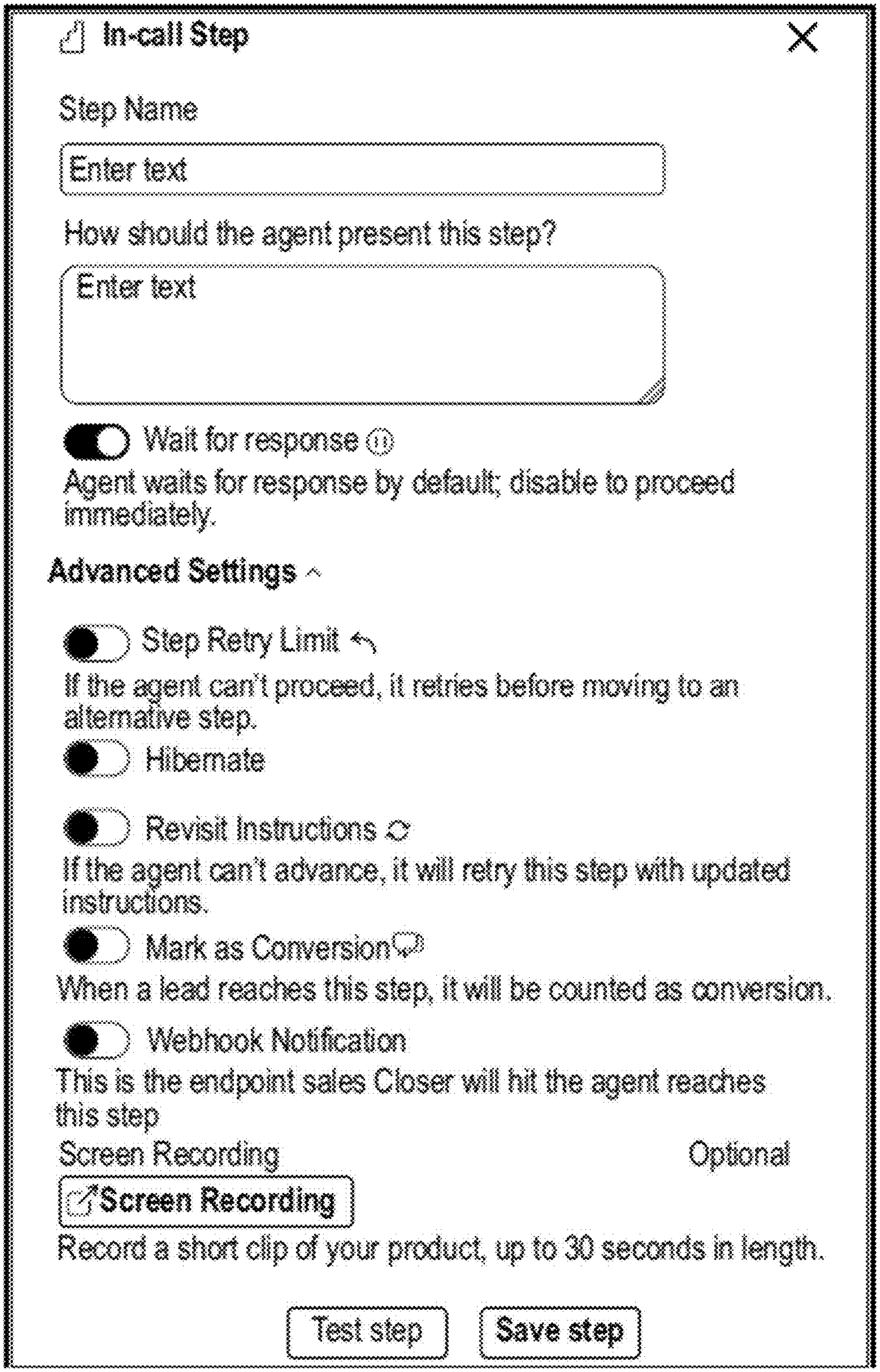


FIG. 10

User dashboard to build to set attributes of the user-defined states



**In-call Step**

Step Name

Enter text

How should the agent present this step?

Enter text

● Wait for response ⓘ

Agent waits for response by default; disable to proceed immediately.

**Advanced Settings** ^

● Step Retry Limit

If the agent can't proceed, it retries before moving to an alternative step.

● Hibernate

● Revisit Instructions

If the agent can't advance, it will retry this step with updated instructions.

● Mark as Conversion

When a lead reaches this step, it will be counted as conversion.

● Webhook Notification

This is the endpoint sales Closer will hit the agent reaches this step

Screen Recording Optional

Record a short clip of your product, up to 30 seconds in length.

FIG. 11

User statement processing with human intervention

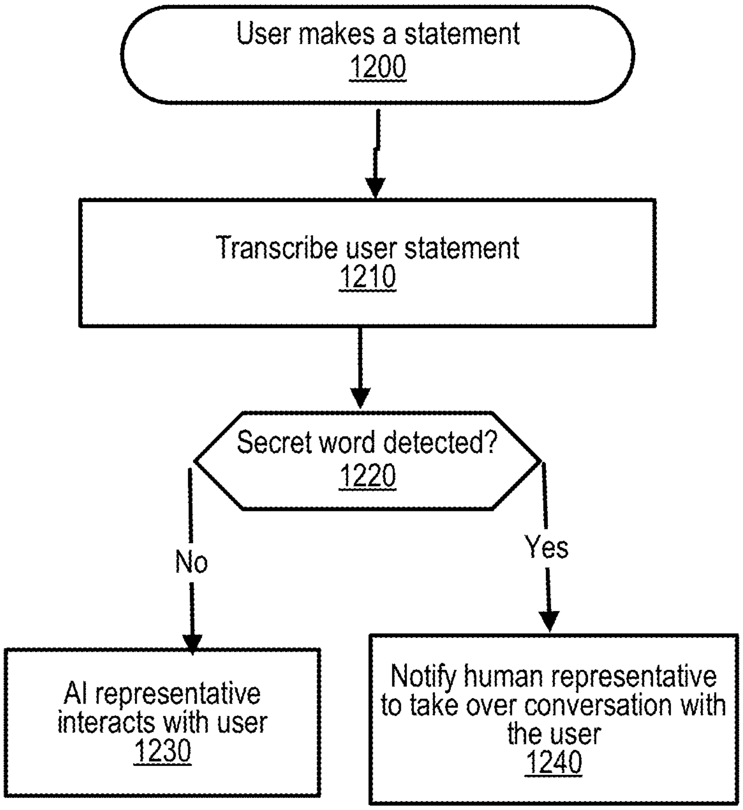
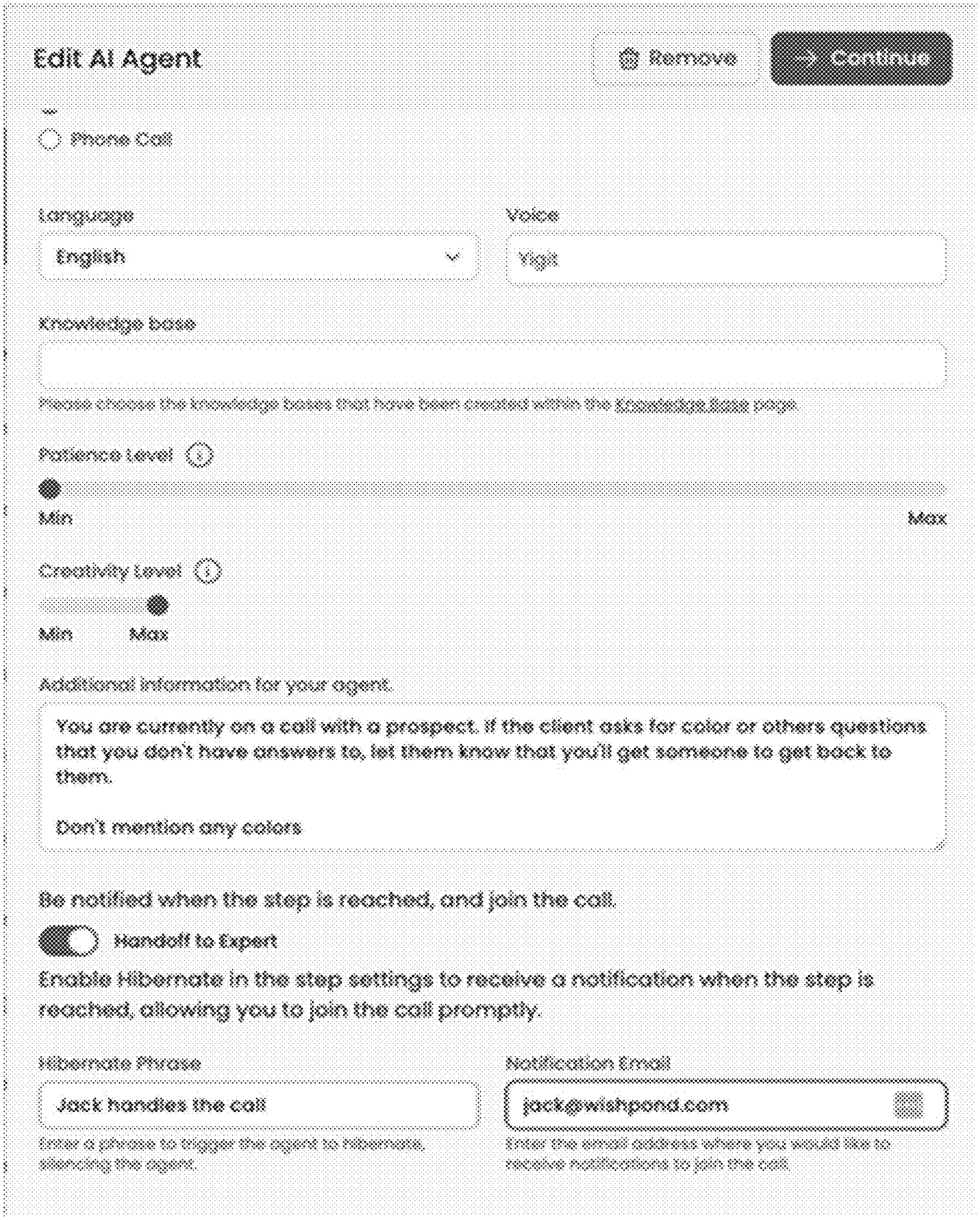

User makes a statement
1200
Transcribe user statement
1210
Secret word detected?
1220
No
Yes
AI representative interacts with user
1230
Notify human representative to take over conversation with the user
1240

FIG. 12

Virtual AI representative dashboard to set the hibernation phrase to activate human takeover feature



○ Phone Call

Language: English

Voice: Yigit

Knowledge base

Please choose the knowledge bases that have been created within the Knowledge Base page.

Patience Level ⓘ
Min Max

Creativity Level ⓘ
Min Max

Additional information for your agent.

You are currently on a call with a prospect. If the client asks for color or others questions that you don't have answers to, let them know that you'll get someone to get back to them.

Don't mention any colors

Be notified when the step is reached, and join the call.

Handoff to Expert

Enable Hibernate in the step settings to receive a notification when the step is reached, allowing you to join the call promptly.

Hibernate Phrase: Jack handles the call

Enter a phrase to trigger the agent to hibernate, silencing the agent.

Notification Email: jack@wishpond.com

Enter the email address where you would like to receive notifications to join the call.

FIG. 13

Process flow for self-testing

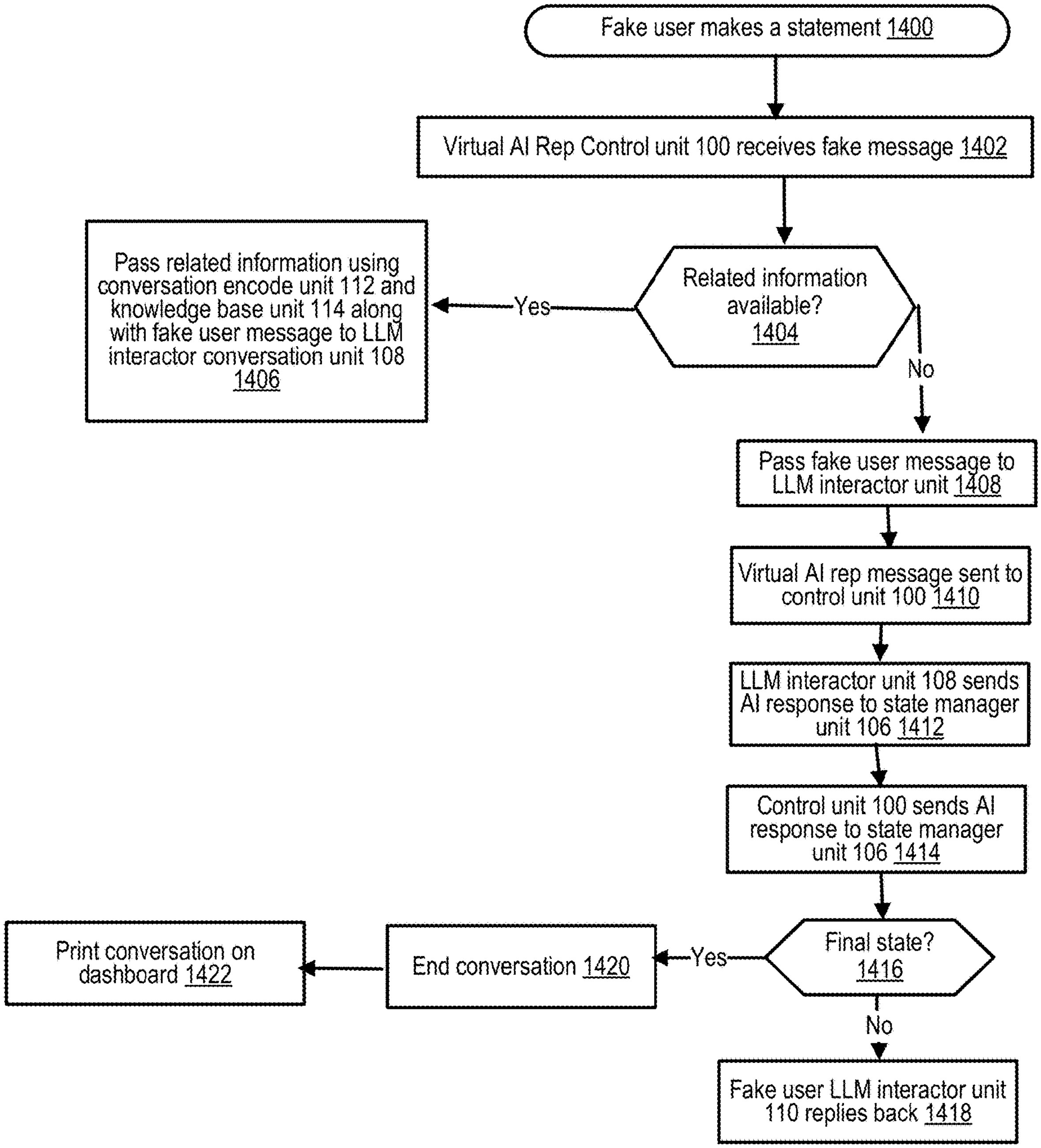
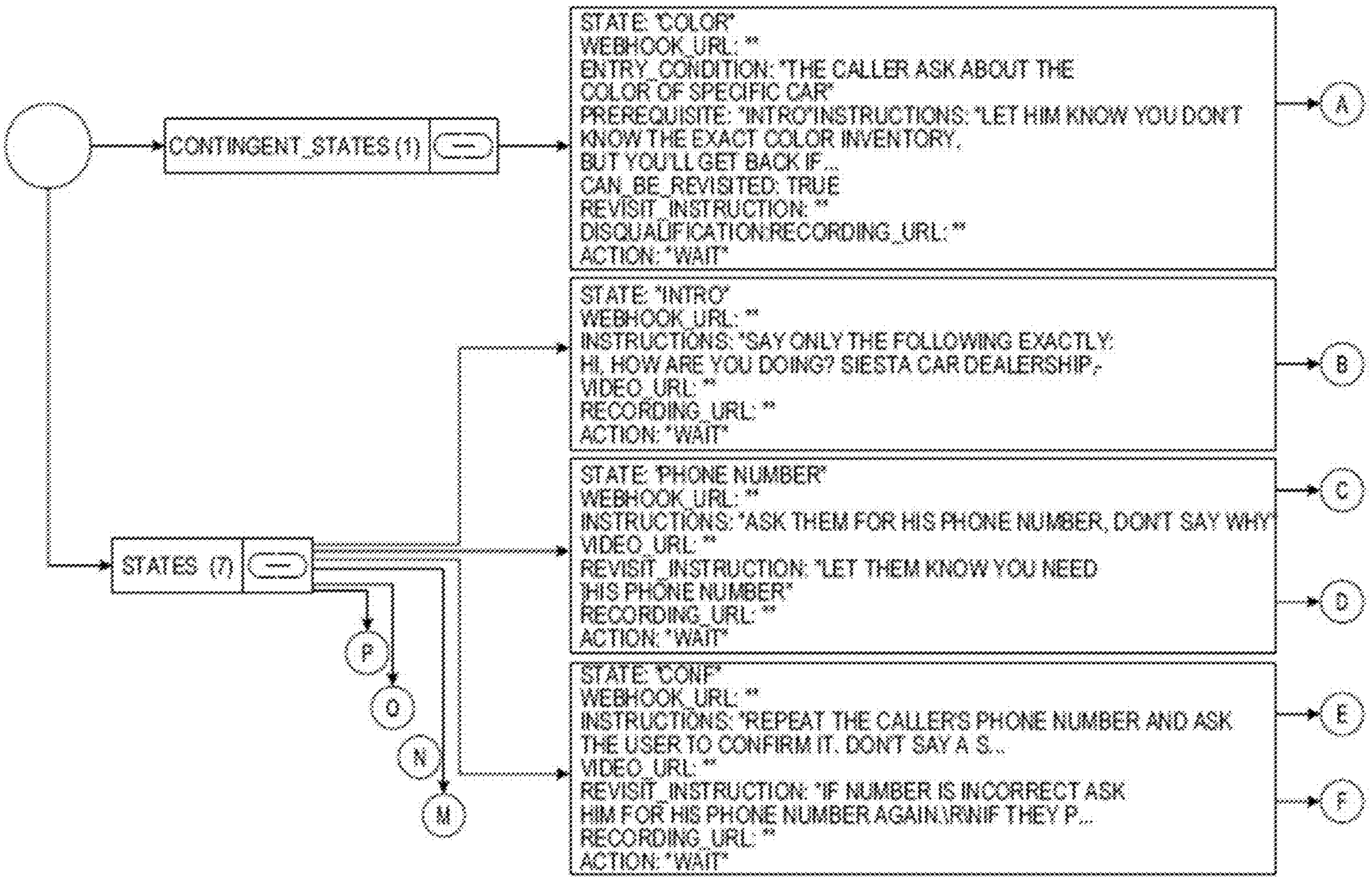

Fake user makes a statement 1400
Virtual AI Rep Control unit 100 receives fake message 1402
Related information available? 1404
Yes
Pass related information using conversation encode unit 112 and knowledge base unit 114 along with fake user message to LLM interactor conversation unit 108 1406
No
Pass fake user message to LLM interactor unit 1408
Virtual AI rep message sent to control unit 100 1410
LLM interactor unit 108 sends AI response to state manager unit 106 1412
Control unit 100 sends AI response to state manager unit 106 1414
Final state? 1416
Yes
End conversation 1420
Print conversation on dashboard 1422
No
Fake user LLM interactor unit 110 replies back 1418

FIG. 14

primary and contingent states for an AI representative which acts as a virtual customer service agent at a car dealershi



STATE: "COLOR"
WEBHOOK_URL: ""
ENTRY_CONDITION: "THE CALLER ASK ABOUT THE COLOR OF SPECIFIC CAR"
PREREQUISITE: "INTRO"INSTRUCTIONS: "LET HIM KNOW YOU DON'T KNOW THE EXACT COLOR INVENTORY, BUT YOU'LL GET BACK IF...
CAN_BE_REVISITED: TRUE
REVISIT_INSTRUCTION: ""
DISQUALIFICATION:RECORDING_URL: ""
ACTION: "WAIT"

STATE: "INTRO"
WEBHOOK_URL: ""
INSTRUCTIONS: "SAY ONLY THE FOLLOWING EXACTLY: HI, HOW ARE YOU DOING? SIESTA CAR DEALERSHIP,-
VIDEO_URL: ""
RECORDING_URL: ""
ACTION: "WAIT"

STATE: "PHONE NUMBER"
WEBHOOK_URL: ""
INSTRUCTIONS: "ASK THEM FOR HIS PHONE NUMBER, DON'T SAY WHY"
VIDEO_URL: ""
REVISIT_INSTRUCTION: "LET THEM KNOW YOU NEED HIS PHONE NUMBER"
RECORDING_URL: ""
ACTION: "WAIT"

STATE: "CONF"
WEBHOOK_URL: ""
INSTRUCTIONS: "REPEAT THE CALLER'S PHONE NUMBER AND ASK THE USER TO CONFIRM IT. DON'T SAY A S...
VIDEO_URL: ""
REVISIT_INSTRUCTION: "IF NUMBER IS INCORRECT ASK HIM FOR HIS PHONE NUMBER AGAIN.\R\NIF THEY P...
RECORDING_URL: ""
ACTION: "WAIT"

FIG. 15

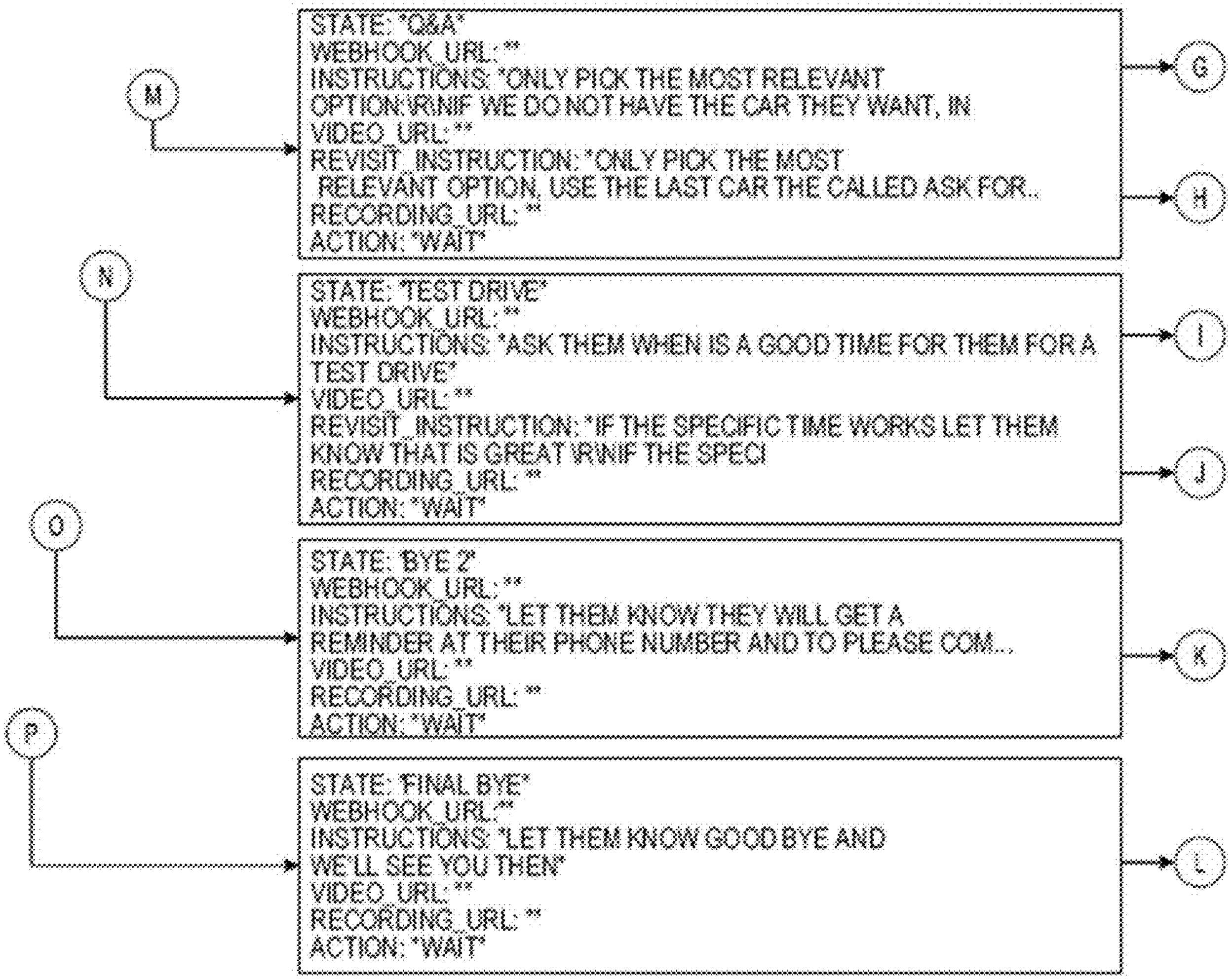

M
STATE: "Q&A"
WEBHOOK_URL: ""
INSTRUCTIONS: "ONLY PICK THE MOST RELEVANT
OPTION:\R\NIF WE DO NOT HAVE THE CAR THEY WANT, IN
VIDEO_URL: ""
REVISIT_INSTRUCTION: "ONLY PICK THE MOST
RELEVANT OPTION, USE THE LAST CAR THE CALLED ASK FOR..
RECORDING_URL: ""
ACTION: "WAIT"
G
H
N
STATE: "TEST DRIVE"
WEBHOOK_URL: ""
INSTRUCTIONS: "ASK THEM WHEN IS A GOOD TIME FOR THEM FOR A
TEST DRIVE"
VIDEO_URL: ""
REVISIT_INSTRUCTION: "IF THE SPECIFIC TIME WORKS LET THEM
KNOW THAT IS GREAT \R\NIF THE SPECI
RECORDING_URL: ""
ACTION: "WAIT"
I
J
O
STATE: "BYE 2"
WEBHOOK_URL: ""
INSTRUCTIONS: "LET THEM KNOW THEY WILL GET A
REMINDER AT THEIR PHONE NUMBER AND TO PLEASE COM...
VIDEO_URL: ""
RECORDING_URL: ""
ACTION: "WAIT"
K
P
STATE: "FINAL BYE"
WEBHOOK_URL:""
INSTRUCTIONS: "LET THEM KNOW GOOD BYE AND
WE'LL SEE YOU THEN"
VIDEO_URL: ""
RECORDING_URL: ""
ACTION: "WAIT"
L

FIG. 15 (Continued)

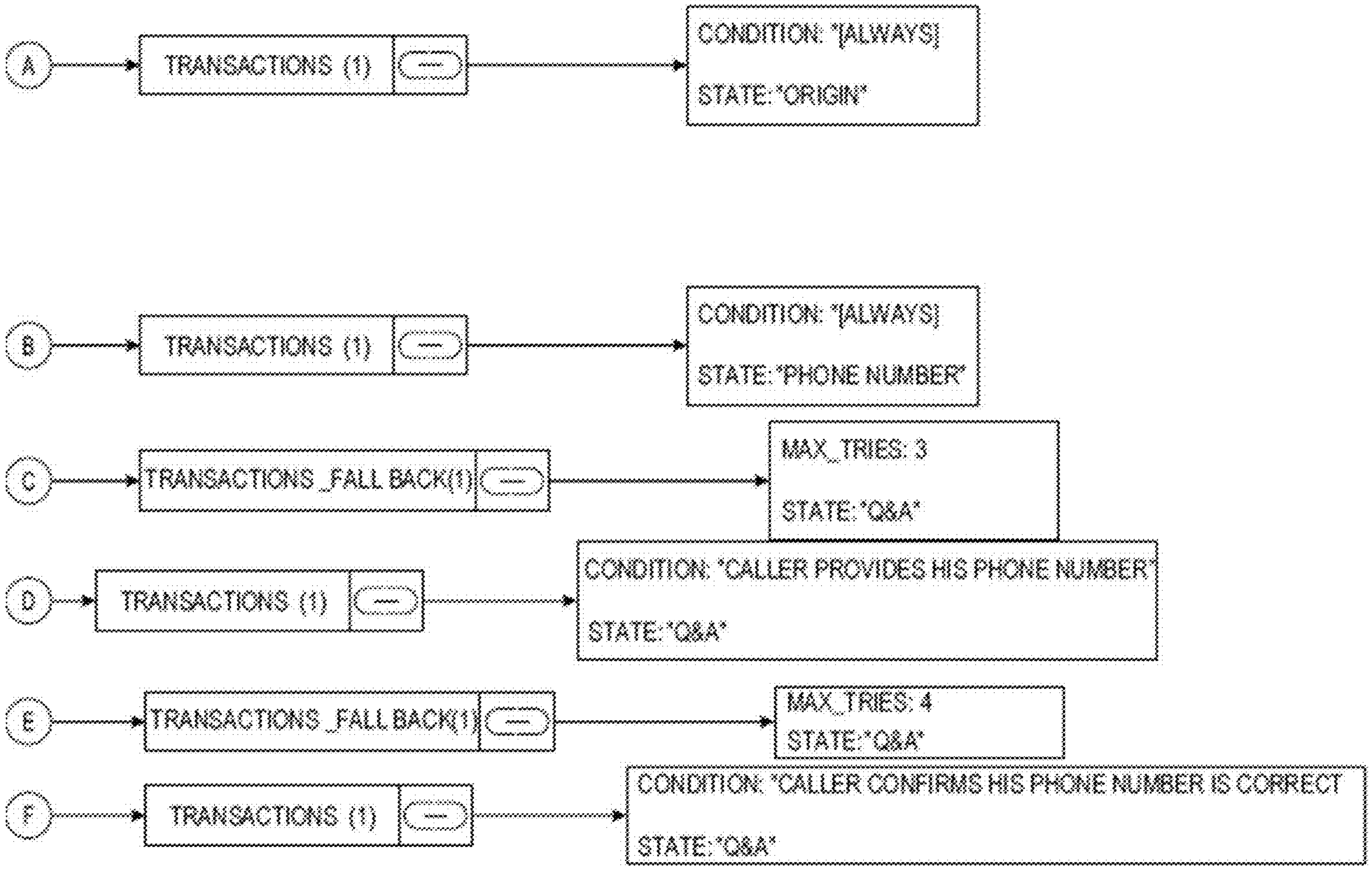


FIG. 15 (Continued)

# ENHANCED STATE MANAGER IN A VIRTUAL AI REPRESENTATIVE

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application is Continuation in Part of U.S. patent application Ser. No. 18/527,241, filed on Dec. 2, 2023, the entire content of which is incorporated herein by reference.

## BACKGROUND

**[0002]** The present invention relates to enhancements in artificial intelligent (AI) assistants, and more particularly transitioning between system supported states and special condition states processed by a multi-purpose virtual AI representative.

## SUMMARY

**[0003]** According to one embodiment of the invention, there is provided a method for transitioning between a main topic state and a tangential topic state in a virtual artificially intelligent (AI) system. A state machine controlling a directed conversation is received by the AI system. A knowledge base is ingested for the directed conversation by the AI system. A first input from a user is processed by the AI system which causes the AI system to enter a first state related to a first topic. Responsive to receiving a second input, by the AI system from the user not related to the first topic, transitioning, by the AI system, into a tangential topic state.

**[0004]** According to one embodiment of the invention, there is provided an information handling system that implements the steps of the method for transitioning between a main topic state and a tangential topic state.

**[0005]** According to one embodiment of the invention, there is provided a computer program instructions executable on a processing circuit to cause the processing circuit to perform the steps of the method for transitioning between a main topic state and a tangential topic state.

**[0006]** The foregoing is a summary and thus contains, by necessity, simplifications, generalizations, and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the present invention will be apparent in the non-limiting detailed description set forth below.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** The present invention may be better understood, and its numerous objects, features, and advantages made apparent to those skilled in the art by referencing the accompanying drawings, wherein:

**[0008]** FIG. **1** illustrates virtual AI representative core architecture;

**[0009]** FIG. **2** illustrates the process flow for virtual AI representative core operative steps;

**[0010]** FIG. **3** illustrates the virtual AI representative architecture including user dashboard, data storage and virtual AI representative fleet manager and core;

**[0011]** FIG. **4** illustrates an exemplary website that employs a virtual AI representative as a sales agent to present the product to interested participants;

**[0012]** FIG. **5** illustrates a participant requesting for initiating a virtual AI presentation session;

**[0013]** FIG. **6** illustrates a participant joining a meeting session after requesting one;

**[0014]** FIG. **7** illustrates a virtual AI representative starting a meeting session;

**[0015]** FIG. **8** illustrates the user dashboard for a product owner to define the specifications of the virtual AI representative;

**[0016]** FIG. **9** illustrates an exemplary hardware architecture required to implement the present invention;

**[0017]** FIG. **10** illustrates the user dashboard to build a sequence of primary and contingent states to guide the conversation;

**[0018]** FIG. **11** illustrates the user dashboard to set attributes of the user-defined states;

**[0019]** FIG. **12** illustrates user statement processing with human intervention;

**[0020]** FIG. **13** illustrates a virtual AI representative dashboard to set the hibernation phrase to activate human takeover feature;

**[0021]** FIG. **14** illustrates a process flow for self-testing; and

**[0022]** FIG. **15** illustrates the graph of primary and contingent states for an AI representative which acts as a virtual customer service agent at a car dealership.

## DETAILED DESCRIPTION

**[0023]** In the following description, for the purposes of explanation, numerous specific details are set forth to provide a thorough understanding of various exemplary embodiments. It is apparent, however, that various exemplary embodiments may be practiced without these specific details or with one or more equivalent embodiments.

**[0024]** In the accompanying figures, the size and relative sizes of elements may be exaggerated for clarity and descriptive purposes.

**[0025]** The terminology used herein is for the purpose of describing particular embodiments and is not intended to be limiting. As used herein, the singular forms, "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. Moreover, the terms "comprises," "comprising," "includes," and/or "including," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, components, and/or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

**[0026]** Implementing a virtual AI representative may face a range of technical challenges that require sophisticated solutions. One important challenge is that standard natural language processing (NLP) models may not be optimized for long, purposeful, real-time, interactive dialogues and might produce responses that are not contextually accurate or coherent with the flow and purpose of the conversation. Another challenge is maintaining a seamless transition between the conversation and the interactive visual presentation, especially when the interactive presentation is conditional on the dialogue flow. Multiple threads are required to monitor various aspects of the conversation, such as user engagement, presence, or intent. Harmonizing these threads to produce a coherent interaction that follows the flow of the conversation is not straightforward. Another complexity is the response rate: to maintain a natural conversation, the system needs to generate responses within a fraction of a second.

**[0027]** In an embodiment, the present invention relates to enhancements in artificial intelligent (AI) assistants, and more particularly transitioning between system supported states and special condition states processed by multi-purpose virtual AI representatives. According to an embodiment of the invention, there is a method for transitioning between a main topic state and tangential topic state in a virtual artificially intelligent (AI) system. The AI system receives a state machine used for controlling a directed conversation by an AI agent. The AI system ingests a knowledge base used by the state machine and the AI agent for controlling the directed conversation. A first input referencing a first topic is received from a user by the AI system. Natural language processing (NLP) is applied to the first input which causes the AI system to enter a first state related to the first topic. Receiving, by the AI system, a second input from the user not related to the first topic. Applying NLP to the second input causes the AI system to enter into the tangential topic state. According to a further feature of the present invention where the second input from the user is a second topic different from the first topic and responsive to determining that the second topic is different from the first topic, by the AI system, separating processing of the second topic into a second processing thread different from a first topic thread dedicated to the first topic. According to a further feature of the present invention, responsive to detecting a third input from the user related to the first topic, by the AI system, restoring processing state to the first state and processing the third input as an entry related to the first topic. According to a further feature of the present invention, responsive to determining the second input is a request to end the first topic, the AI system transitions to an early goodbye final state.

**[0028]** Embodiments of the present invention introduce an advanced state management mechanism within a virtual AI representative system, specifically designed to enhance the management of conversational dynamics by managing transitions that involve tangential topics, interruptions by users, or premature conversation endings, which traditional state managers do not handle effectively.

**[0029]** Disclosed is a sophisticated enhancement to the state manager unit in virtual AI representative systems, introducing a refined mechanism capable of handling both system-defined and user-defined states. The upgraded state manager controls various states-including 'Audio Connection', 'First State', 'Hold', 'Interrupt', 'Tangent', 'Question', 'Early Goodbye', 'Follow Up', and 'Repeat'—to ensure seamless conversational transitions and maintain flow, even under complex conditions. Its innovative aspect is the integration of user-defined states with customizable attributes such as retry limits, revisit instructions, and webhook notifications, providing unprecedented flexibility and control. This enables the AI to dynamically adapt to different conversational paths and conditions, effectively managing interruptions and deviations in real-time. This system is particularly suited for applications ranging from customer service to interactive presentations, significantly enhancing user interactions by making them more natural and responsive. This invention marks a substantial advancement in AI conversational systems, expanding their applicability across various domains.

**[0030]** The disclosed approach is crucial for navigating the complexities of conversational dynamics. The AI system seamlessly transitions between topics, maintains context over the course of the interaction, and responds appropriately to the wide range of queries and conversational cues presented by users.

**[0031]** This disclosure presents an innovative enhancement to the state manager unit within a virtual AI representative system, introducing a refined and complex state management mechanism. The enhanced state manager is uniquely designed to control both system-defined and user-defined states. The enhanced state manager incorporates a wide range of functionalities that significantly improve conversational dynamics and user interaction. System-defined states such as 'Audio Connection', 'First State', 'Hold', 'Interrupt', 'Tangent', 'Question', 'Early Goodbye', 'Follow Up', and 'Repeat' are meticulously managed to ensure seamless transitions and maintain the flow of conversation, even in complex scenarios. A novelty of this enhanced state manager lies in its capability to integrate user-defined states with customizable attributes like retry limits, revisit instructions, and webhook notifications. These attributes allow for unprecedented flexibility and control, enabling the AI to adapt to various conversational paths and conditions dynamically. The system can effectively handle interruptions, deviations, and user interactions in real-time, making it ideal for a range of applications from customer service to interactive presentations.

**[0032]** The combination of advanced state management with real-time adaptability and user-configurable settings distinguishes this invention in the field of virtual AI representatives. It not only enhances the user experience by making AI interactions more natural and responsive but also expands the potential for AI applications in diverse environments. Embodiments of the approaches disclosed herein provide a significant step forward in the sophistication and functionality of AI conversational systems.

**[0033]** In an embodiment, the enhanced state manager operates by continuously monitoring the conversation, employing system and user-defined states to predict and react to shifts in the dialogue's direction. User-defined states are customized by users to tailor the virtual AI representative to specific operational needs, facilitating smooth and intuitive interactions. Conversely, system-defined states are predefined and consistent across all instances of the virtual AI representatives, serving as transitional states for each user-defined state. The enhanced state manager dynamically adjusts the AI's responses and strategies in real-time, ensuring that the conversation remains coherent and contextually appropriate. The state manager is equipped with capabilities to retain and recall the context over extended interactions, even after diversions or interruptions, thus maintaining a meaningful and continuous user engagement.

**[0034]** The implementation of this enhanced state manager not only elevates the user experience but also broadens the AI representative's applicability across various domains requiring nuanced conversation management, such as customer service, therapy sessions, or any interactive system where dialogue continuity and coherence are critical. By ensuring that conversations flow naturally and intelligently, this invention sets a new standard for AI interaction, providing a more adaptive and responsive conversational interface.

**[0035]** An embodiment of the present invention relates to enhancements in artificial intelligent (AI) assistants, and more particularly providing a fast path for human takeover. According to an embodiment of the invention, there is a method for initiating a human takeover by a virtual artificially intelligent (AI) agent. A predetermined indication is used as a signal for initiating the human takeover across a variety of contexts. Responsive to detecting the predetermined indication, a human operator is automatically notified to take over the conversation and the AI system is prepared for transferring control to a human operator. According to a further feature of the present invention, the predetermined indication is adjustable. According to a further feature of the present invention, where the predetermined indication is verbal. According to a further feature of the present invention, responsive to detecting the predetermined indication, disabling components different from a voice processing unit of the AI system. According to a further feature of the present invention, capturing a transcript of conversations.

**[0036]** In order to overcome the deficiencies of the prior art, a novel system is introduced within the domain of virtual AI representatives, specifically engineered to facilitate a direct and seamless transition from an AI-controlled conversation to human oversight. A predefined signal is identified to be recognized by the AI system. In an embodiment, a verbal indication is defined, for example, implementation of a "secret word" mechanism. This functionality allows users to quickly initiate a handover to a human operator by uttering a predefined secret word. The system is designed to recognize this cue and seamlessly switch control, ensuring the conversation continues without interruption and with full context retention.

**[0037]** An embodiment of the present invention relates to enhancements in artificial intelligent (AI) assistants, and more particularly testing multi-purpose virtual AI representatives. According to an embodiment of the invention, there is a method for testing a virtual artificially intelligent (AI) agent. User inputs are generated automatically across a variety of contexts. The automatically generated user inputs are sent to the AI agent. The processing of the input sent to the AI agent is recorded. The recorded processing is analytically analyzed to assess coherency and relevance. A self-test report of the AI agent is generated based on the assessed coherency and relevance.

**[0038]** FIG. **1** shows embodiments of the present invention that includes a system for an artificially intelligent virtual representative. Elements shown in FIG. **1** may be implemented in software. As shown in FIG. **1**, the system of the present invention includes the following components:

**[0039]** Controller unit **100** serves as the central processing and orchestration unit in the system. It is the brain behind the operations, ensuring synchronization between different threads and processes. Through a series of event queues, controller unit **100** communicates with various components, responding to and processing events such as user interactions, system updates, and audio inputs. An event queue is a data structure that operates based on the First-In-First-Out (FIFO) principle. The event queue is used to store and manage events or messages that need to be processed. In multithreaded applications such as the present invention, an event queue helps in achieving thread-safe communication between threads.

**[0040]** User input unit **102** is responsible for receiving and processing user voice inputs that come from the meeting application or medium. Transcriber unit **118** resides within user input unit **102**. The primary role of transcriber unit **118** is to convert the captured audio data into textual format, essentially "transcribing" spoken words into readable text. Leveraging available advanced speech recognition algorithms, transcriber unit **118** analyzes the audio data. Controller unit **100** messages user input unit **102** at the beginning of the conversation to mark the start of the conversation. State manager unit **106** functions as a dynamic state machine, meticulously tracking and guiding the flow of conversation. The state manager utilizes a range of predefined states to facilitate a structured yet adaptable interaction, catering to a variety of conversational objectives. Each state within this system is defined by unique attributes including a unique identifier, directives on how to respond in each state, optional associated visual content, instructions for the next course of action (transiting to the next state and the conditions for the transit). For example, if the state is a "wait for response" state, the AI system waits for the user to provide a response. If the state is a "move forward" state, then the AI system does not wait for the user's input before progressing to the next state. When a message is received and transcribed by the transcriber unit, the transcriber unit assigns a unique number to it, so the message looks like this {identifier:2345, message: "how can your product help us?" }. This identifier is used throughout the life cycle of the message, for handling interruption or speeding up the response process.

**[0041]** State manager unit **106** includes two groups of states: user-defined states and system-defined states. System-defined states include "audio connection," "first state," "hold," "interrupt," and "tangent." Any other states defined by the user to customize the virtual AI representative for their specific use and to ensure a fluid and intuitive interaction are called user-defined states. Controller unit **100** waits in "audio connection" state until it receives a message from the user at the beginning of the meeting to transit to the "first state." All user-defined states can transit to the "interrupt" state if the user interrupts the virtual AI representative while presenting; reverting back post-interruption. Queries deviating from the meeting's flow trigger a transition to the "tangent" state, allowing the virtual AI representative to address off-topic inquiries. A user request for a pause shifts the state to "hold." Each state associates with corresponding visual content on the meeting platform, which pauses when the state transitions and resumes when back in that state again. Transitions between states are guided by conditions that act as triggers, dictating the requirements for movement and identifying the destination state. LLM interactor-conversation unit **108** decides if the transitions conditions are met and determines the state of conversation in each conversation cycle, the conversation cycle consists of a back and forth between the participant and the virtual AI representative.

**[0042]** State manager unit **106** can be adjusted to act as a persona with a different set of states. For instance, the virtual AI representative presented in this disclosure can emulate a virtual AI sales agent when provided with a suitable set of states and a product knowledge base to provide contextual information for knowledge base unit **126**. States dictate how the agent navigates the presentation while demonstrating the product and the knowledge base that provides the agent with prior information about the product. The states for this specific example are included in Table 1. Each state has a name, instruction, transition condition, the next state, and the action the agent must take after delivering the instruction.

TABLE 1

States for the virtual AI representative to emulate a virtual sales agent

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and ask something about the weather or any suitable small talk. | [ALWAYS] | Agenda | wait |
| Agenda | Outline the agenda for the meeting; tell how you will demonstrate how the product work and can help with their business. mention that the first 10 minutes you'll try to understand the business, then let them know that you are going to share your screen | [ALWAYS] | Product | wait |
| Product | Show them how the product work via screen share and how it can help their requirements | [ALWAYS] | Final | wait |
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | Thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0043]** The user-defined states for this specific example are Agenda, Product, and Final. User-defined states provided in Table 1 can be more than the ones presented here to refine the conversation and to provide more instruction to the AI sales agent. System-defined states are hold, tangent, interruption, audio connection, and first state. At the beginning of the conversation, the AI agent is in state audio-connection. When the AI agent receives a participant's voice, the AI agent transits to the first-state in which it welcomes the participant. The agent transits to the agenda state in which it outlines the agenda for the meeting. When there is a message from the participants, controller unit **100** sends the message to LLM interactive-conversation unit **108** and LLM interactive-conversation unit **108** answers the message and determines the state in which the AI agent resides.

**[0044]** Arranging the set of states as in Table 2 can tailor the virtual AI representative to emulate an instructor. A course curriculum and related information on the topic of interest is provided to the virtual AI representative via knowledge base unit **126**. User-defined states provided in Table 2 can be more than the ones presented here to refine the conversation and to provide more instruction to the virtual AI instructor.

TABLE 2

States for the virtual AI representative to emulate a virtual instructor

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and ask something about the weather or any suitable small talk. | [ALWAYS] | Agenda | wait |
| Agenda | Outline the agenda for the class for that specific session; then let them know that you are going to share your screen | [ALWAYS] | Subject | wait |
| Subject | Start with some background on the topic, and then the main concept. Check with them during the presentation to make sure they are following the conversation. | [ALWAYS] | Final | wait |

TABLE 2-continued

States for the virtual AI representative to emulate a virtual instructor

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0045]** Arranging the set of states as in Table 3 can tailor the virtual AI representative to emulate a healthcare provider. Related medical knowledge on the topic of specialty is provided to the virtual AI representative via knowledge base unit **126**. User-defined states provided in Table 3 can be more than the ones presented here to refine the conversation and to provide more instruction to the virtual AI healthcare provider.

TABLE 3

States for the virtual AI representative to emulate a virtual healthcare provider

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and ask how they are doing and how you can help | [ALWAYS] | Agenda | wait |
| Agenda | Outline the process for them and mention you share the screen | [ALWAYS] | Subject | wait |
| Discovery | Start asking about the issue that prompt them to seek help. | [ALWAYS] | Final | wait |
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0046]** The set of states in Table 4 can be used for the virtual AI representative to emulate a customer service representative. User-defined states provided in Table 4 can be more than the ones presented here to refine the conversation.

TABLE 4

States for the virtual AI representative to emulate a virtual customer service representative

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and ask how you can help them with the product or service in question. | [ALWAYS] | Discovery | wait |
| Discovery | Answer any question regarding the product. | [ALWAYS] | Final | wait |
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |

TABLE 4-continued

States for the virtual AI representative to emulate a virtual customer service representative

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0047]** The set of states in Table 5 can be used for the virtual AI representative to emulate a virtual advisory service provider (i.e. a financial service advisor). User-defined states provided in Table 5 can be more than the ones presented here to refine the conversation.

TABLE 5

States for the virtual representative to emulate a virtual advisory service provider

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and ask how you can help them with them | [ALWAYS] | Discovery | wait |
| Discovery | Answer any question regarding the product/service. Provide Personalized suggestions on the service/product to their specific need. | [ALWAYS] | Final | wait |
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0048]** The set of states in Table 6 can be used for the virtual AI representative to emulate a virtual recruiter. User-defined states provided in Table 6 can be more than the ones presented here to refine the conversation.

TABLE 6

States for the virtual AI representative to emulate a virtual recruiter

| State name | instruction | Transition goal | Next state | Action |
|---|---|---|---|---|
| Audio connection | Ask if they can hear you. Wait until you hear their answer. | [ALWAYS] | First state | wait |
| First state | Welcome them and thank them to join the presentation. Explain the position and requirements for the position. | [ALWAYS] | Discovery | wait |
| Discovery | Ask about their background, and experience. | [ALWAYS] | Final | wait |
| Tangent | Answer any question they might have and redirect the conversation back to the main flow. | [ALWAYS] | Previous state | wait |
| Hold | Check if they are ready to continue | [ALWAYS] | Previous state | wait |
| Final | thank them for their time and let them know what are the next steps. | [ALWAYS] | | wait |

**[0049]** The current state of the conversation is determined by LLM interactive-conversation unit **108**. The progression of the states is not strictly sequential and can follow various paths depending on the input or other conditions. States with associated visual content can deliver relevant visual information or demonstrations throughout the conversation.

**[0050]** Action controller unit **110** is an integrated system that encompasses three primary components: action recorder unit **112**, action player unit **114**, and video recorder/player unit **116**. Video recorder/player unit **116** records brief video snippets during the initialization of the virtual AI representative instance. These recorded snippets serve as a reservoir of content, ready for playback during presentations. Their deployment is contingent upon the presentation's context and state of the conversation passed by controller unit **100**. Action recorder unit **112** meticulously records all events, including mouse clicks and keyboard strokes, capturing their precise timing when defining the virtual AI representative. Additionally, it embeds "merge tags" within these recordings. Such tags allow for real-time adaptability. For example, if a user originally searched for the weather in Vancouver, the embedded merge tag for "Vancouver" can be seamlessly replaced with another city during a later conversation. Action player unit **114** can mold screen activities during an interactive presentation based on the conversation's context, especially when the virtual AI representative is introducing a new product using the merge tags and the pre-recorded videos. In live presentations, action player unit **114** performs two critical roles. Firstly, it ensures that the timing of the playback mirrors the initial recording. Secondly, it actively monitors browser network activities, making real-time adjustments to the event timings. As an example, if a webpage originally took 2 seconds based on the data provided by action recorder unit **112** but requires 5 seconds during a live presentation, action player unit **114** recalibrates the timing of subsequent events.

**[0051]** Vocalizer unit **138** is an audio processing system, seamlessly integrating three specialized sub-units to deliver optimized voice outputs including audio generator unit **120**, audio caching unit **122**, audio player unit **124**. Audio generator unit **120** generates voice snippets for individual sentences. While several available deep learning models can be employed for this purpose, fine-tuning of the model is required to ensure the fastest response in voice generation. Fine-tuning is done by providing the LLM with some sample conversation scenarios. Audio caching unit **122** serves as a repository, diligently maintaining a database of each vocalized sentence. The primary advantage of this cache is swift access when possible. By storing pre-vocalized sentences, the system dramatically reduces the time required to generate voice snippets for frequently used words or phrases, enhancing overall efficiency and speed. Audio player unit **124** is responsible for the actual playback of the voice snippets. The choice of both the voice format and the playback technology is rooted in their reliability and efficiency. However, the modular nature of vocalizer unit **138** ensures flexibility. If the need arises, alternative technologies and libraries can be integrated to replace the current voice format and playback mechanism.

**[0052]** Knowledge base unit **126** is a system designed to consolidate, process, and provide information tailored to both the product being presented and the user engaged in the conversation. The main objective of knowledge base unit **126** is to provide personalization and context for a purposeful conversation. This unit amalgamates three pivotal components: knowledge base encoder unit **128**, LLM interactor—user profiler unit **130**, and knowledge base **132**. Knowledge base **132** acts as a contextual hub. As discussions around the product evolve, knowledge base **132** dynamically provides relevant product-specific information and user-specific recommendations, ensuring that the conversation remains both informed and engaging.

**[0053]** Knowledge base encoder unit **128** is adept at transforming raw documents into structured, searchable formats. Knowledge base encoder unit **128** employs advanced vectorization techniques to convert documents into a format conducive to rapid searches and retrievals. Subsequent to vectorization, knowledge base encoder unit **128** establishes a database. This reservoir is primed with rich information about the product under discussion, ensuring that the AI virtual representative is equipped with comprehensive product knowledge.

**[0054]** LLM interactor—user profiler unit **130** gathers insights about the user throughout the presentation's duration, as interactions with the user progress, LLM interactor—user profiler unit **130** assiduously records and updates the background information acquired about the user. This includes preferences, past interactions, queries, feedback, and other pertinent details. This reservoir of insights not only ensures that every engagement with the user is rooted in historical context but also paves the way for more personalized and intuitive future interactions. Beyond cataloging user details, LLM interactor—user profiler unit **130** also holds the responsibility of strategizing and noting down future actions post the user interaction. For instance, if a discussion culminates in the decision to share a contract with the user, this action is duly noted and passed to controller unit **100**, which eventually will be passed to LLM interactive-conversation unit **108**. Similarly, commitments made during the conversation, like sharing case studies or further information, are systematically recorded. This proactive approach ensures that every commitment made during an interaction is passed to controller unit **100** for required actions after meetings.

**[0055]** User conversation encoder unit **134** acts as a reservoir that encodes users' questions and inputs into vectors across all meetings with different participants for a specific instance of virtual AI representative and then uses this reservoir to find similar question and answer sets. Controller unit **100** polls user conversation encoder unit **134** every time a new user message is received. If user conversation encoder unit **134** finds an existing suitable answer to the user message from before, controller unit **100** uses the existing message as a response to the user and skips sending the message to LLM interactive-conversation unit **108**. The main objective of the unit is to improve response time.

**[0056]** Interrupt and user monitoring unit **136** monitors user presence and interrupts to inform controller unit **100** if there is a need to change the state of the conversation. This unit maintains two event queues: "user_activity_event_queue" and "controller_event_queue." "user_activity_event_queue" is used by controller unit **100** to inform the interrupt and user monitoring unit **136** about other interactions using the following events: "final_state_timeout_triggered," "long_inactivity_timeout_triggered," "user_inactivity_timeout_triggered," and "user_response_playback_triggered." Controller unit **100** uses "user_inactivity_timeout_triggered" message to start a process of checking on the user every 20 seconds and uses "long_inactivity_timeout_triggered" message to end the conversation after 5 minutes if there is no answer. When in the final state, controller unit **100** uses a "final_state_timeout_triggered" message to end the conversation after a period of inactivity from the user to ensure the conversation has ended gracefully. Controller unit **100** uses "user_response_playback_triggered" message to inform interrupt and user monitoring unit **136** that the user is done talking and now we are waiting on the AI response from LLM interactive-conversation unit **108**.

**[0057]** Application Programming Interface (API) server unit **140**, as embodied in the present invention, serves as an interface for the virtual AI representative, designed to handle synchronous communication events and audio data transmissions. The primary objective of this unit is to efficiently manage a series of events, such as participants joining or leaving a virtual meeting platform (meeting application unit **142**), or any status changes within the meeting through its '/webhook' endpoint. Depending on the nature of the event received, API server unit **140** triggers an appropriate function, placing the event details into an event queue for subsequent handling by controller unit **100**. Another salient feature of API server unit **140** is its capability to handle raw audio data from virtual meetings. Through the '/meeting-raw-audio' API endpoint, the unit accepts raw binary audio data and subsequently queues it into an "audio_output_queue" for controller unit **100** to pass it to transcriber unit **118**. In sum, API server unit **140** in the present invention, effectively bridges the virtual AI representative with external systems, while ensuring seamless event and audio data management.

**[0058]** Meeting application unit **142** used in the virtual AI representative is to provide a bidirectional communication channel between the virtual AI representative and a potential participant. The modular design of the virtual AI representative makes it possible for any meeting application to be used as a component as long as it has the capability of passing the raw audio and autonomous screen share. For the present innovation, Zoom Software Development Kit (SDK) is used as the meeting application.

**[0059]** Data flow within the virtual AI representative core is depicted in FIG. **2**. The conversation cycle includes a back and forth between the participant and the virtual AI representative, upon reception of user's verbal communication (step **200**), user input unit **102** commences speech-to-text conversion (step **202**), resulting in one or more transcribed interim messages. Each transcribed interim message is tagged with a unique integer identifier before being forwarded to controller unit **100**. In step **212** of FIG. **2**, controller unit **100** sends an inquiry to user conversation encoder unit **134** to check if there is any available AI response in the cache before making an inquiry. Controller unit **100** sends an inquiry to knowledge base unit **126** to find relevant information based on the user's message (step **204**); if the poll results in any related information or answer, controller unit **100** creates a system message based on the poll. Controller unit **100** sends user messages alongside the system message to LLM interactive-conversation unit **108** (step **203** and step **205**).

**[0060]** Upon receipt of LLM interactive-conversation unit **108** response (AI response) in step **206**, the state of the conversation is determined (step **208**) and controller unit **100** prompts audio generator unit **120** to synthesize an audio file corresponding to the AI response (step **210**). The audio file may be played (step **214**). Any visuals may be rendered on the screen according to the state and AI response (step **216**). Once the audio file is generated, it is sent back to controller unit **100**, and then forwarded to vocalizer unit **138**, setting it in standby mode.

**[0061]** If a new interim message from the participant is detected during this process, the existing audio file is discarded. The system reverts to the interim message handling stage, and the cycle repeats to generate a new response for the virtual sales agent.

**[0062]** When user input unit **102** receives the participant's final spoken message (step **218** final state yes), controller unit **100** checks its similarity against the last interim message. If they are similar, controller unit **100** prompts vocalizer unit **138** to play the already generated audio. Otherwise, the system returns to the interim message handling stage (step **200**) to generate a new AI response corresponding to the user's final message. This new response is then vocalized and played. At step **220**, the conversation ended. At step **222**, next steps to support CRM are sent to CRM.

**[0063]** FIG. **3** draws an overview of the platform software architecture. User dashboard frontend **300** is a stand-alone application including Virtual AI representative frontend module **302** and knowledge base frontend module **304** that provides user **358** with access to create or manage virtual AI representative instances to present a product. User dashboard backend **306** includes API module **308** via API calls **322** to communicate with database **314** accessing data storage **312**, and via API calls **324** to communicate with virtual AI representative instances, and fleet manager **310**. Fleet manager **310** uses API calls **326** to communicate with virtual AI representative core instance **318**.

**[0064]** In FIG. **3**, presenter docker **316** is created using a serverless compute engine (such as AWS Fargate©[1] or similar services). User dashboard backend **306** oversees the containers, handling tasks such as creation, stopping, and status querying using fleet manager **310**. Subsequently, fleet manager **310** invokes presenter docker **316**. A new presenter container is initialized for every meeting session (i.e. presenter docker **316** is a dedicated container for only one meeting). Presenter docker **316** comprises two components: Virtual AI representative core instance **318** and meeting application **320**. API calls **328** are used to communicate between Virtual AI representative core instance **318** and meeting application **320**. API calls **328** are used to communicate between Virtual AI representative core instance **318** and meeting application **320**.

**[0065]** Upon the initiation of a presenter docker container, two main instances are activated to start and manage the meeting. The first is virtual AI representative core instance **318**, which is responsible for overseeing meeting application instance **320** and ensuring seamless communication with the user dashboard backend **306**. Its role is pivotal; if this process were to exit, the container would stop functioning, indicating its significance in the architecture.

**[0066]** Meeting application instance **320** is launched in conjunction with virtual AI representative core instance **318**. This secondary instance is governed by virtual AI representative core instance **318** and operates under the directives of a representational state transfer (REST) API specific to the meeting application. Its primary function is to start a meeting session that allows for the display of presentations

[1] AWS Fargate is a registered trademark of Amazon Technologies, Inc.

through window sharing. Moreover, it supports bidirectional audio streams, facilitating interactive communication channels during meetings.

**[0067]** FIG. **4** illustrates an exemplary website indicated by Wishpond **302** that employs a virtual AI representative to present the product to interested leads. Upon clicking on Get a Demo **300** button, participant **500** is asked to login **301** and after logging in, participant **500** is asked for his/her email address and the meeting link is sent to the email address. By clicking on the Uniform Resource Locator (URL) or what is colloquially known as an address on the Web, the meeting starts. The virtual AI representative starts the presentation showing how to reach new customers and increase sales affordably **303**.

**[0068]** FIG. **5** illustrates in detail the chain of events when a participant requests a meeting/presentation. To start a presentation, fleet manager **310** starts presenter docker **316** and injects environment variables. The environment variables are: "meeting id" and API credentials. Meeting id identifies a specific instance of a virtual AI representative (e.g. the same participant might have multiple meetings scheduled). API credentials are used by virtual AI representative core instance **318** to call into API module **145**.

**[0069]** Virtual AI representative instance **318** makes API calls to user dashboard backend **306** to fetch the blueprint of states, lead information (participant name to use in the meeting etc.), and knowledge base information.

**[0070]** Virtual AI representative core instance **318** kicks off the process by first stopping all existing meeting application instance **320** processes within presenter docker **316**, and then starts meeting application instance **320** via the command line. Meeting application instance **320** sends a meeting URL to virtual AI representative core instance **318** via webhooks to http://localhost:4000. Virtual AI representative core instance **318** sends the meeting URL to user dashboard backend **308** using REST API POST. When meeting application instance **320** starts, virtual AI representative core instance **318** controls it using a REST API located at localhost:3000 with "start_meeting," "stop_meeting," "play_audio," and "share_window" end points.

**[0071]** Webhooks sent by meeting application instance **320** to virtual AI representative core instance **318** includes "meeting_started," "meeting_stopped," "meeting_failed," "meeting_connecting," "meeting_disconnecting," "user_joined," "user_left," "sharing_status_changed."

**[0072]** Meeting application instance **320** sends raw audio from the participant to virtual AI representative core instance **318**.

**[0073]** To launch a meeting, virtual AI representative core instance **316** fetches information about the meeting from dashboard backend **306**, then runs a worker job to start the meeting (FIG. **6**). Upon receiving the meeting URL from virtual AI representative core instance **318**, user dashboard backend **306** sends the meeting URL to participant **500**. If user dashboard backend **306** does not receive the meeting URL after a period of time, it can decide to terminate presented docker **316** and start the container again if desired.

**[0074]** In FIG. **7**, virtual AI representative core instance **318** starts the meeting with an API call to meeting application instance **320** and sends the welcome voice snippet. Meeting application instance **320** confirms receiving the voice snippet and relays it to meeting instance **512**. Then virtual AI representative core instance **318** initiates screen share and waits for the response from meeting instance **512**. Upon receiving the response, virtual AI representative core instance **318** follows the steps in FIG. **2** and continues the conversation.

**[0075]** FIG. **8** illustrates user dashboard frontend **141**. User **358** uses the software tool available on user dashboard frontend **141** to create and manage virtual AI representatives and the flow of the conversation via defining states for state manger unit **106**. The example user dashboard shown contains entries Sales Closer by Wishpond **401**, AI Agents **400**, Knowledge base **402**, Analytics **404**, and Recordings **406** as user selectable selections. Details include voice **410**, product **412**, and Knowledge Base **414**.

**[0076]** FIG. **9** illustrates the hardware architecture of the present invention. The present invention's platform architecture is outlined as follows: Users engage with system server **900** via client device **901**. Client device **901** connects to server **902** through network **914** and can operate on any chosen computing platform. Server **902** interfaces with client devices over this network to provide a user or graphical user interface (GUI) for system **900**. This interface, accessible via web browsers or specific software applications, facilitates data display, entry, publication, and management, acting as a meeting interface. The term "network" refers to a network collection appearing as one to users, including the Internet, which connects using Internet Protocol (IP) and similar protocols. The public network **914** depicted in FIG. **9** serves only as an example.

**[0077]** Server **902** may offer services relying on a database system accessible over a network and via server **936**. The GUI or meeting interface, provided by server **902** on client device **901** via a web browser or app, allows for operation and utilization of service system **900**. The components in system server **902** and **936** represent a combination necessary for providing the services and tools envisioned by the invention. These components, which may communicate over a wide area network (WAN) or local area network (LAN), include an application server or executing unit **904** comprising a web server **906** and **942** and a computer server **908** and **944**. The web server responds to Hypertext Transfer Protocol (HTTP) requests from remote browsers or software applications, providing the necessary user interface. The computer server may include a processor **910** and **946**, RAM, and ROM, controlled by operating system software for resource allocation and task management.

**[0078]** The database tier, with at least one database server **903**, interfaces with multiple databases **912**, updated via private networks including the Internet. Although described as a single database, separate databases can store various user data and files.

**[0079]** Application server **940**, custom-built for this invention, enables various tasks related to creating and customizing the virtual AI representative. The virtual AI representative may be implemented on an exemplary system server **938**. "User dashboard" henceforth refers to the web browser interfaces for accessing application server **940** of this invention. Application server **940** communicates with application **905** via API calls through network **914**. "Virtual AI representatives instance" henceforth refers to application **905**. Users interact with meeting application **907** via web server **906**. "Meeting instance" henceforth refers to the web interface of meeting application **907**.

**[0080]** Client devices **901** may include a range of electronic devices with various components. For instance, client device **901** may feature a display **918**, processor **920**, input device **922**, transceiver **924**, memory **928**, app **930**, local data store, and a data bus interconnecting these components. The term "transceiver" encompasses any known transmitter or receiver for communication. These components may vary, and alternative embodiments are considered within the invention's scope.

**[0081]** In an embodiment, communication begins when an audio message is sent by either the virtual representative or the user, triggering the communication. This audio is then translated into written text, each instance of which is assigned a distinct numerical identifier before being forwarded to controller unit **100**. Controller unit **100**, in turn, instructs user conversation encoder unit **134** to search knowledge base unit **126** for pertinent information. Utilizing this information, the system crafts messages from both the system's and the user's perspectives and directs them to LLM interactive-conversation unit **108**. LLM interactive-conversation unit **108** then produces a text-based reply, which is subsequently synthesized into an audio message for the user's consumption in vocalizer unit **138**. Should there be an interruption with a new message from the user while this process is underway, the audio response is modified to reflect this latest communication. Only an audio file that is confirmed to be current and representative of the user's most recent message is played. With each round of dialogue, the unique numerical tag is advanced, readying the system for the next round of interaction.

**[0082]** In an embodiment, at each step controller unit **100** uses LLM interactive-conversation unit **108** and state manager unit **106** to infer the state and parameters of the conversation that are passed to action controller unit **110** to create the suitable action to be presented on the screen alongside the vocalized response from LLM interactive-conversation unit **108**. Synchronizing the visual part of the interactive presentation with the conversation is a challenge that this embodiment addresses via interaction between controller unit **100**, action controller unit **110**, and state manager unit **106**.

**[0083]** The embodiment further includes the various states of the conversation comprising preparation, hold, wait, abandon, or finalized. There may be further states as well and this is flexible and may be provided to controller unit **100**. For each different product that the AI virtual representative presents, the number of states can be adjusted accordingly.

**[0084]** Fine-tuning LLM interactive-conversation unit **108** for interactive conversation is essential because standard NLP models may not be optimized for real-time, interactive dialogues, and they might produce responses that are not contextually accurate or coherent. Leveraging an LLM interactor as a knowledge base for context, combined with another LLM interactor for user profiling that provides related information as personalized context, can help fine-tune pre-trained language models such as NLP model **139** on domain-specific data, thereby significantly enhancing performance and yielding more contextually accurate and coherent responses.

**[0085]** Synchronizing conversation flow and interactive presentation is an essential aspect in creating a seamless transition especially when the presentation is conditional on the dialogue flow. To solve this problem, in the present invention, event-driven architecture is implemented in controller unit **100** to trigger specific presentation steps based on a blueprint provided to state manager unit **106** at the time of the creation of the AI virtual representative code **154**. State manager unit **106** is a robust dialogue management system used by controller unit **100** alongside the LLM interactor-conversation unit **108** that is capable of adaptively controlling the flow of the conversation. To create synchronization between the audio and video controller unit **100** infers the step and parameters of the conversation from the response of LLM interactive-conversation unit **108** and sends it to action controller unit **110** to be played alongside the vocalized response of LLM interactor-conversation unit **108**.

**[0086]** Harmonizing asynchronous threads is a complex task, especially when multiple threads are running to monitor various aspects of the conversation, including user engagement, sentiment, or intent. However, in the present invention, the use of message queues, shared state-management systems, flags, and events within the threads can be instrumental in synchronizing these various asynchronous tasks, ensuring a more coherent interaction.

**[0087]** Maintaining a natural conversation flow and minimizing response delay are crucial for user experience. To ensure a conversation feels natural, the system must generate responses within a fraction of a second, a challenge due to both the computational complexity of LLMs and the network response rate. One solution is to implement a stateful conversation model that remembers past interactions and context, helping preserve a seamless flow. When users pose a new inquiry, controller unit **100** polls user conversation encoder unit **134** to identify useful AI responses from the past. If a match is found, controller unit **100** quickly prompts vocalizer unit **138** to ensure a swift and relevant reply.

**[0088]** Systems such as traditional sales models that rely heavily on human agents to manage customer queries, presentations, and follow-ups often face scalability challenges. In contrast, the virtual AI representative can manage multiple interactions at once and offers easy scalability. This capability enables businesses to cater to an expanding customer base without the need to proportionally increase their workforce.

**[0089]** Systems that rely heavily on human resources, such as those with a large sales team, can become expensive due to salaries, benefits, and training costs. In contrast, the virtual AI representative described in this invention offers a more cost-effective solution over time. The virtual AI representative not only eliminates the need for a sizable team but also ensures continuous **24/7** service.

**[0090]** Human representatives might sometimes lack immediate access to comprehensive customer data, hindering their ability to offer a truly personalized experience. In contrast, the AI virtual representative has the capability to swiftly analyze user's data, enabling it to provide highly personalized recommendations and solutions. This not only enhances user engagement but also potentially boosts conversion rates.

**[0091]** Human representatives can occasionally experience off days, and their level of expertise might differ from one individual to another, which can result in varying presentation experiences. On the other hand, the virtual AI representative is designed to provide a consistent level of service, guaranteeing that each interaction aligns with the desired quality standards.

**[0092]** Unlike human representatives who aren't available 24/7, potentially posing challenges for businesses that operate across various time zones or for users who seek interactions beyond standard business hours, the virtual AI representatives have the advantage of being available continuously. This ensures constant support and engagement for users at any given time.

**[0093]** While human representatives typically manage just one interaction at a time and might exhibit slower response times during peak hours or while multitasking, the virtual AI representatives excel in offering prompt feedback. This capability ensures that users receive answers or information with minimal delay, enhancing the overall user experience.

**[0094]** Decision-making during a course of a real-time interaction often hinges on intuition and experience rather than concrete data when done by human representatives. However, the virtual AI representative is equipped to amass and scrutinize extensive data, furnishing invaluable insights into user behaviors and predilections. Such insights can be pivotal for shaping future strategies and making informed decisions. This advantage is not just limited to sales; various other domains can also benefit from employing virtual AI representatives to harness data-driven insights.

**[0095]** When businesses or organizations venture into global markets, they often encounter language barriers, especially if they lack employees proficient in the target market's language at various locations. In contrast, virtual AI representatives can be endowed with capabilities to understand and communicate in multiple languages. This adaptability facilitates seamless engagement with a diverse and global user base.

**[0096]** By addressing these challenges, the present invention provides a virtual AI representative that offers a transformative solution for businesses and organizations, enabling them to improve customer engagement, drive sales, operate more efficiently, improve customer care, and serve better.

**[0097]** When a user defines the user-defined states and their associated attributes as illustrated in FIG. **11**, the state manager unit **106**, comprising multiple classes and methods, integrates both system-defined and user-defined states. This integration ensures that all system-defined states serve as transitional states for each user-defined state. Upon the initiation of a conversation between the user and an AI representative, the transcriber unit relays the transcribed user input to the state manager unit through the controller unit. Transition Conditions and Instructions are state attributes utilized by the state manager unit **106** to handle transitions between the various possible states of a conversation. The Transition Condition attribute specifies the criteria that the LLM interactor-conversation unit **108** employs to select the correct transition state at each step of the conversation. The Instruction attribute directs the LLM interactor-conversation unit **108** to generate an appropriate response to the user corresponding to the state to which the conversation has transitioned. Utilizing the user input and all the valid states' transition conditions as a prompt for the LLM Interactor-conversation unit **108**, the state manager unit determines the subsequent state in the conversation. Additionally, the state manager unit proactively follows up with the user in the event of user inactivity to maintain ongoing engagement. The unit is also tasked with concluding the conversation, which it does by assessing whether the current state is a final state. When a final state, such as an early goodbye, is reached, the state manager unit instructs the controller unit to terminate the conversation.

**[0098]** This example illustrates how the state manager unit **106** orchestrates a conversation cycle with a real-world user when deployed as a customer service AI representative for a car dealership. The system-defined states of this AI representative are depicted in FIG. **16**. The process begins with the "intro" state, where the AI representative greets the user and awaits a response. Upon receiving a response, the state manager evaluates multiple transition options. According to the configuration, all system-defined states are potential transitions for any user-defined state, and "phone number"—the subsequent user-defined state-serves as a transition from the "intro" state. For instance, if the user responds with, "Hi, I'm fine. How about you?", the state manager progresses the dialogue to the "phone number" state. At this juncture, the conversation can diverge along two paths. If the user requests a brief hold, saying, "Could you please hold on?", all relevant transition conditions are passed to the LLM Interactor-conversation unit **108** to determine the appropriate next state, which, in this case, would be "Hold". This state is triggered by the system-defined condition: "If the user asks to pause the conversation briefly to attend to an urgent matter." Alternatively, if the user provides a phone number, the state manager transitions the conversation to the next appropriate user-defined state. The conversation continues in this manner until it reaches a final state. If the state determined by the LLM Interactor-conversation unit **108** is a final state, then there would be no further transitions, and the conversation will conclude

**[0099]** FIG. **12** depicts embodiments of the present invention that includes the human takeover feature. The mechanism for activating this feature is user-friendly and accessible via the AI representative's dashboard, where the human operator can set or change the secret word during the AI agent's configuration phase, as depicted in FIG. **13**. In the scenario depicted in FIG. **13**, the designated secret word is "Jack handles the call." The system automatically notifies the human operator by sending an email to jack@wishpond.com. This flexibility allows operators to tailor the AI's responses and intervention triggers to suit specific operational needs or to adapt to different conversational contexts, thereby significantly enhancing the AI representative's usability and effectiveness in real-world applications.

**[0100]** As is shown in FIG. **1**, the process of human takeover begins when transcriber unit **118** (shown in FIG. **3**) captures and transcribes the user's message. During this transcription, the system actively scans for the presence of a "secret key", which is predefined by a human operator. If this secret key is detected within the transcription of the user's message, the system triggers a sequence of events designed to transfer control to the human operator. Specifically, the operator is immediately notified via email, prompting them to take over the ongoing conversation. Concurrently, all components of the AI representative are temporarily disabled, with the exception of transcriber unit **118**. This continued operation of transcriber unit **118** is crucial as it ensures that a complete and accurate transcription of the conversation is maintained, even after the human operator has assumed control. This transcript is valuable for various post-meeting applications, such as review, compliance, training, or quality assurance purposes. By preserving a detailed record of the interaction, the system provides an essential resource for enhancing service quality and understanding user interactions in depth, thereby contributing significantly to ongoing improvements in AI and operator performance.

**[0101]** FIG. **12** depicts a user statement processing that triggers human intervention. At step **1200**, the user makes a statement. At step **1210**, the user's statement is transcribed. A determination is made as to whether the secret word is detected (decision **1220**). If the secret word is detected, then decide **1220** branches to the 'yes' branch. On the other hand, if no secret word is detected, then decide **1220** branches to the 'no' branch. At step **1230**, the AI's representative interacts with the user. At step **1240**, the human representative is notified to take over conversation with the user.

**[0102]** The Controller unit **100** operates as the primary processing entity, coordinating the system's operations. It ensures seamless integration of various threads and processes, leveraging event queues for communication with essential components, including handling inputs from a fake user and updates from the state manager. These event queues, adhering to the First-In-First-Out (FIFO) protocol, are pivotal in organizing and sequentially processing messages or events. In the context of this multithreaded system, such queues are instrumental in facilitating secure and efficient inter-thread communication, essential for the system's overall functionality and performance.

**[0103]** The state manager unit **106** serves as an advanced dynamic state machine, accurately monitoring and directing the progress of conversation. It employs a set of predefined states, designed to support structured yet flexible interactions that meet various conversational goals. Within the system, each state is characterized by specific attributes: a distinct identifier, response directives for each situation, guidelines for transitioning to subsequent states along with the criteria for such transitions, and a designation of whether the state awaits fake user input ("wait for response") or proceeds without it ("move forward").

**[0104]** The user conversation encoder unit **134** serves as a database that converts user queries and inputs into vector formats during interactions across various meetings with distinct participants, specific to each deployment of the virtual AI representative. This conversion facilitates the identification of similar queries and corresponding answers from past interactions. Upon receiving a new message from a user, the Controller Unit **100** consults the user conversation encoder unit **134** to check for an existing, appropriate response. If a relevant answer is found, the Controller Unit **100** directly provides this response to the user, thus omitting the need to process the query through the LLM interactive-conversation unit **108**. This mechanism aims to significantly reduce the response time by leveraging past interactions to streamline current ones.

**[0105]** The fake user input unit **104** is a critical part of the self-testing mechanism, designed to simulate real user interactions. When testing begins, the AI representative initiates a conversation, and the fake user input unit generates responses by employing a system message that combines a generic template with profile information. This system message ensures responses are appropriately tailored to mimic a real user engagement. The testing continues, cycling through all states managed by the state manager unit **106**, to comprehensively evaluate the AI representative's readiness before actual user engagement.

**[0106]** The system message is pivotal in the operation of the self-testing system and method. It is constructed from a generic template that dictates the behavior of the fake user throughout the conversation, supplemented by profile information that defines the conversation's context.

**[0107]** The profile information segment of the system message incorporates synthetic user details, including name, age, business background, business name, insights into the user's business, and the purpose of the meeting with the AI representative. This segment shapes the conversation's context when interacting with the AI representative.

**[0108]** To ensure that responses are not just relevant but are also tailored to the intricacies of the conversation at hand, fine-tuning the LLM to the domain and interaction styles anticipated in its deployment is necessary. This tailored approach improves the ability of the virtual AI representative to interpret complex queries, maintain coherence throughout the conversation, and respond in a manner that feels intuitive and human-like to users. Ultimately, fine-tuning acts as the critical link transforming a competent LLM into one that offers genuine interactivity and engagement, ensuring a smooth and enhanced user experience.

**[0109]** FIG. **14** shows the steps taken by a self-testing process that is initiated when a fake user makes a statement. At step **1402**, the control unit **100**, which is acting as a virtual AI representative, receives the fake message. The process determines whether related information is available (decision **1404**). If related information is available, then decide **1404** branches to the 'yes' branch. On the other hand, if no related information is available, then decide **1404** branches to the 'no' branch. At step **1406**, the process passes related information using user conversation encoder unit **134** and knowledge base unit **126** along with the fake user message to the LLM interactive-conversation unit **148**. At step **1408**, the process passes fake user message to the LLM interactive-conversation unit **108**. At step **1410**, the virtual AI rep message is sent to control unit **100**. At step **1412**, the process LLMs interactor unit **148** sends the AI response to state manager unit **106**. At step **1414**, the process controller unit **100** sends AI response to state manager unit **106**. The process determines the final state (decision **1416**). If the final state, then decide **1416** branches to the 'yes' branch. On the other hand, if not the final state, then decide **1416** branches to the 'no' branch. At step **1418**, the LLM interactive-conversation unit **108** replies back. FIG. **14** processing thereafter ends at **1420**. At step **1422**, the process prints conversation on the dashboard.

**[0110]** In an embodiment, the interaction is initiated with a text message from the fake user input unit **104**, which is then relayed to the controller unit **100**. The controller unit **100** then signals the user conversation encoder unit **134** to consult the knowledge base unit **126** for relevant data. Leveraging this data, the system generates messages reflecting both the system's and the user's viewpoints, forwarding these to the LLM interactive-conversation unit **108**. This unit assesses the current state, generates a textual response, and dispatches it back to the controller unit **100**. Subsequently, the controller unit **100** submits this state to the state manager unit **106** for evaluation to ascertain whether it represents a final state or not. If the final state is not reached, the AI representative's reply is routed to the LLM interactive-conversation unit **108** via the controller unit **100**. Conversely, if the final state is reached, the dialogue between the fake user and the AI representative concludes, allowing the user to inspect the exchanged messages and navigated states through the dashboard.

**[0111]** At the completion of interactions between the fake user and the AI representative, a detailed report is generated and made accessible on the dashboard for user review. This report meticulously outlines each message exchanged during the conversation, alongside the sequence of states traversed. Its primary purpose is to facilitate a thorough examination of the "user-defined" states, confirming their accurate configuration and seamless integration within the conversational flow. Such scrutiny ensures that these states effectively direct the virtual AI representative in conducting genuine and engaging dialogues with actual users. Furthermore, the report provides insight into the dynamics of the conversation, highlighting the ability of the AI representative to produce responses that are not only coherent but also deeply aligned with the specific context of the dialogue. This aspect of the report is crucial for assessing the AI representative's conversational competence and its capacity to adapt responses to fit the nuanced demands of real-life interactions. Employing this self-testing mechanism is a critical step towards validating the AI representative's readiness for real-user engagement. It not only underscores the operational efficacy of the system but also its capability to deliver a user experience that is both seamless and contextually rich. By ensuring that the AI representative can handle a wide spectrum of conversational scenarios with appropriate responsiveness and relevance, this process significantly strengthens the system's utility and reliability ahead of its deployment in live environments.

**[0112]** The present invention may be a system, a method, and/or a computer program product at any possible technical detail level of integration. The computer program product may include a computer readable storage medium (or media) having computer readable program instructions thereon for causing a processor to carry out aspects of the present invention.

**[0113]** The computer readable storage medium can be a tangible device that can retain and store instructions for use by an instruction execution device. The computer readable storage medium may be, for example, but is not limited to, an electronic storage device, a magnetic storage device, an optical storage device, an electromagnetic storage device, a semiconductor storage device, or any suitable combination of the foregoing. A non-exhaustive list of more specific examples of the computer readable storage medium includes the following: a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), a static random access memory (SRAM), a portable compact disc read-only memory (CD-ROM), a digital versatile disk (DVD), a memory stick, a floppy disk, a mechanically encoded device such as punch-cards or raised structures in a groove having instructions recorded thereon, and any suitable combination of the foregoing. A computer readable storage medium, as used herein, is not to be construed as being transitory signals per se, such as radio waves or other freely propagating electromagnetic waves, electromagnetic waves propagating through a waveguide or other transmission media (e.g., light pulses passing through a fiber-optic cable), or electrical signals transmitted through a wire.

**[0114]** Computer readable program instructions described herein can be downloaded to respective computing/processing devices from a computer readable storage medium or to an external computer or external storage device via a network, for example, the Internet, a local area network, a wide area network and/or a wireless network. The network may comprise copper transmission cables, optical transmission fibers, wireless transmission, routers, firewalls, switches, gateway computers and/or edge servers. A network adapter card or network interface in each computing/processing device receives computer readable program instructions from the network and forwards the computer readable program instructions for storage in a computer readable storage medium within the respective computing/processing device.

**[0115]** Computer readable program instructions for carrying out operations of the present invention may be assembler instructions, instruction-set-architecture (ISA) instructions, machine instructions, machine dependent instructions, microcode, firmware instructions, state-setting data, configuration data for integrated circuitry, or either source code or object code written in any combination of one or more programming languages, including an object oriented programming language such as Smalltalk, C++, or the like, and procedural programming languages, such as the "C" programming language or similar programming languages. The computer readable program instructions may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider). In some embodiments, electronic circuitry including, for example, programmable logic circuitry, field-programmable gate arrays (FPGA), or programmable logic arrays (PLA) may execute the computer readable program instructions by utilizing state information of the computer readable program instructions to personalize the electronic circuitry, in order to perform aspects of the present invention.

**[0116]** Aspects of the present invention are described herein with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems), and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer readable program instructions.

**[0117]** These computer readable program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks. These computer readable program instructions may also be stored in a computer readable storage medium that can direct a computer, a programmable data processing apparatus, and/or other devices to function in a particular manner, such that the computer readable storage medium having instructions stored therein comprises an article of manufacture including instructions which implement aspects of the function/act specified in the flowchart and/or block diagram block or blocks.

**[0118]** The computer readable program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other device to cause a series of operational steps to be performed on the computer, other programmable apparatus or other device to produce a computer implemented process, such that the instructions which execute on the computer, other programmable apparatus, or other device implement the functions/acts specified in the flowchart and/or block diagram block or blocks.

**[0119]** The flowchart and block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various embodiments of the present invention. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of instructions, which comprises one or more executable instructions for implementing the specified logical function(s). In some alternative implementations, the functions noted in the blocks may occur out of the order noted in the Figures. For example, two blocks shown in succession may, in fact, be executed concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts or carry out combinations of special purpose hardware and computer instructions.

**[0120]** While particular embodiments have been shown and described, it will be obvious to those skilled in the art that, based upon the teachings herein, that changes and modifications may be made without departing from this invention and its broader aspects. Therefore, the appended claims are to encompass within their scope all such changes and modifications as are within the true spirit and scope of this invention. Furthermore, it is to be understood that the invention is solely defined by the appended claims. It will be understood by those with skill in the art that if a specific number of an introduced claim element is intended, such intent will be explicitly recited in the claim, and in the absence of such recitation no such limitation is present. For non-limiting examples, as an aid to understanding, the following appended claims contain usage of the introductory phrases “at least one” and “one or more” to introduce claim elements. However, the use of such phrases should not be construed to imply that the introduction of a claim element by the indefinite articles “a” or “an” limits any particular claim containing such introduced claim element to inventions containing only one such element, even when the same claim includes the introductory phrases “one or more” or “at least one” and indefinite articles such as “a” or “an”; the same holds true for the use in the claims of definite articles.

What is claimed is:

**1**. A method for transitioning between a main topic state and a tangential topic state in a virtual artificially-intelligent (AI) system, comprising:

receiving by an AI system, a state machine controlling a directed conversation;

ingesting a knowledge base for the directed conversation by the AI system;

processing, by the AI system, a first input from a user causing the AI system to enter a first state related to a first topic;

receiving, by the AI system, a second input from the user not related to the first topic; and

transitioning, by the AI system, into a tangential topic state.

**2**. The method of claim **1**, wherein the second input from the user is a second topic different from the first topic and

responsive to determining that the second topic is different from the first topic, separating processing of the second topic into a second processing thread different from a first topic thread dedicated to the first topic.

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

responsive to detecting a third input from the user related to the first topic, by the AI system,

restoring processing state to the first state and processing the third input as an entry related to the first topic.

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

responsive to determining the second input is requested to end the first topic, the AI system transitions to an early goodbye final state.

**5**. An information handling system for transitioning between a main topic state and a tangential topic state in a virtual artificially-intelligent (AI) system, comprising:

a plurality of processors;

a memory coupled to at least one of the processors;

a set of computer program instructions stored in the memory and executed by at least one of the processors in order to perform actions:

receiving by the AI system, a state machine controlling a directed conversation;

ingesting a knowledge base for the directed conversation by the AI system;

processing, by the AI system, a first input from a user causing the AI system to enter a first state related to a first topic;

receiving, by the AI system, a second input from the user not related to the first topic; and

transitioning, by the AI system, into a tangential topic state.

**6**. The information handling system of claim **5**, wherein the second input from the user is a second topic different from the first topic and

responsive to determining that the second topic is different from the first topic, separating processing of the second topic into a second processing thread different from a first topic thread dedicated to the first topic.

**7**. The information handling system of claim **6**, further comprising:

responsive to detecting a third input from the user related to the first topic, by the AI system,

restoring processing state to the first state and processing the third input as an entry related to the first topic.

**8**. The information handling system of claim **7**, further comprising:

responsive to detecting a third input from the user related to the first topic, by the AI system,

restoring processing state to the first state and processing the third input as an entry related to the first topic.

**9**. The information handling system of claim **5**, further comprising:

responsive to determining the second input is requested to end the first topic, the AI system transitions to an early goodbye final state.

**10**. A computer program product for transitioning between a main topic state and a

tangential topic state in a virtual artificially-intelligent (AI) system having program instructions embodied therewith, the program instructions executable on a processing circuit to cause the processing circuit to perform the steps comprising:

ingesting a knowledge base for the directed conversation by the AI system;

processing, by the AI system, a first input from a user causing the AI system to enter a first state related to a first topic;

receiving, by the AI system, a second input from the user not related to the first topic; and

transitioning, by the AI system, into a tangential topic state.

**11**. The computer program product claim **11**, wherein the second input from the user is a second topic different from the first topic and

responsive to determining that the second topic is different from the first topic, separating processing of the second topic into a second processing thread different from a first topic thread dedicated to the first topic.

**12**. The computer program product claim **12**, further comprising:

responsive to detecting a third input from the user related to the first topic, by the AI system,

restoring processing state to the first state and processing the third input as an entry related to the first topic.

**13**. The computer program product claim method of claim **11**, further comprising:

responsive to determining the second input is requested to end the first topic, the AI system transitions to an early goodbye final state.

**14**. A computer-implemented method for managing state transitions in a virtual artificially intelligent (AI) system, the method comprising:

receiving, by a state management module, a state machine defining a plurality of system-defined states and user-defined states, each state associated with unique attributes including transition conditions and responses;

ingesting, by the AI system, a knowledge base associated with the conversation topic to dynamically adapt conversational flows;

Processing, by a natural language processing (NLP) engine, a first user input associated with a first topic to transition the AI system into a first state related to the first topic;

detecting, by the NLP engine, a second user input associated with a second topic distinct from the first topic, the second input satisfying predefined transition conditions;

transitioning, by the state management module, the AI system to a tangential topic state associated with the second topic while preserving context data related to the first state;

monitoring, by the state management module, subsequent user inputs for a context restoration trigger to transition the AI system back to the first state upon detecting the trigger;

enabling, responsive to a predefined user signal, a human takeover mechanism by notifying a human operator and transferring control of the conversation to the human operator, while maintaining a transcript of the conversation for continuity; and

outputting, by the AI system, visual and audio outputs synchronized with the state transitions to enhance the user's interactive experience.

**15**. The computer-implemented method of claim **14**, wherein the knowledge base dynamically updates based on real-time user inputs to refine conversational responses.

**16**. The computer-implemented method of claim **14**, further comprising analyzing historical user interactions to optimize transition conditions for future state transitions.

**17**. The computer-implemented method of claim **14**, wherein the visual and audio outputs are pre-cached for frequently used transitions to minimize response latency.

**18**. A system for managing conversational states in a virtual artificially intelligent (AI) system, comprising:

a state management module configured to define system-defined and user-defined states, each state associated with attributes including transition conditions, responses, and context retention rules;

a knowledge base unit configured to provide contextual information related to predefined conversation topics;

a natural language processing (NLP) engine configured to process user inputs and determine conversational intents for transitioning between states;

a context restoration module configured to:

detect user inputs related to previous states; and

restore the AI system to a prior state while maintaining context continuity;

a human intervention module configured to:

detect a predefined user signal indicating the need for human intervention;

notify a human operator; and

transfer control of the conversation to the human operator while retaining conversation transcripts; and

a visual and audio synchronization module configured to dynamically adjust multimedia outputs based on the current state and transitions.

**19**. The system of claim **18**, wherein the state management module dynamically generates user-defined states with customizable retry limits and webhook notifications.

**20**. The system of claim **18**, wherein the human intervention module includes a customizable secret phrase mechanism for activating human takeover.

**21**. The system of claim **18**, further comprising an encoder module to convert user inputs into vectorized representations for context-aware response generation.

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