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OBSERVATION-BASED FORM ASSISTANT

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OBSERVATION-BASED FORM ASSISTANT

ABSTRACT

A virtual, intelligent, or computational assistant (e.g., also referred to simply as an "assistant") is described that is configured to selectively aid users when completing forms (e.g., documents, surveys, orders, fields, questionnaires, set of questions, etc.) or other online activities for which aid can be offered. When a user is filling out a form, the assistant may monitor the user's rate of progress (e.g., filling out) of the form. If the rate decreases, the assistant may offer aid in completing the form. If the user accepts the aid, the assistant may fill in some or all of the form.

DESCRIPTION

Assistants execute on counter-top devices, mobile phones, automobiles, and many other type of computing devices. Assistants output useful information, responds to users' needs, or otherwise performs certain operations to help users complete real-world and/or virtual tasks. Some assistants may be able to complete portions of, or entire, forms for users. However, the assistants may not always be able to accurately complete the forms and/or users may become annoyed at the assistant constantly offering assistance where none may be needed/wanted.

The example system shown in FIG. 1 provides an assistant that is configured to selectively aid users when completing forms. As opposed to automatically offering to complete or automatically completing forms presented to a user, the assistant may monitor the user's rate of progress and offer assistance in completing the form if the rate decreases.

EXTERNAL SYSTEMS

ASSISTANT

USER A INFORMATION

USER B INFORMATION

NETWORK

COMPUTING DEVICE A

ASSISTANT

USER INFORMATION

COMPUTING DEVICE N
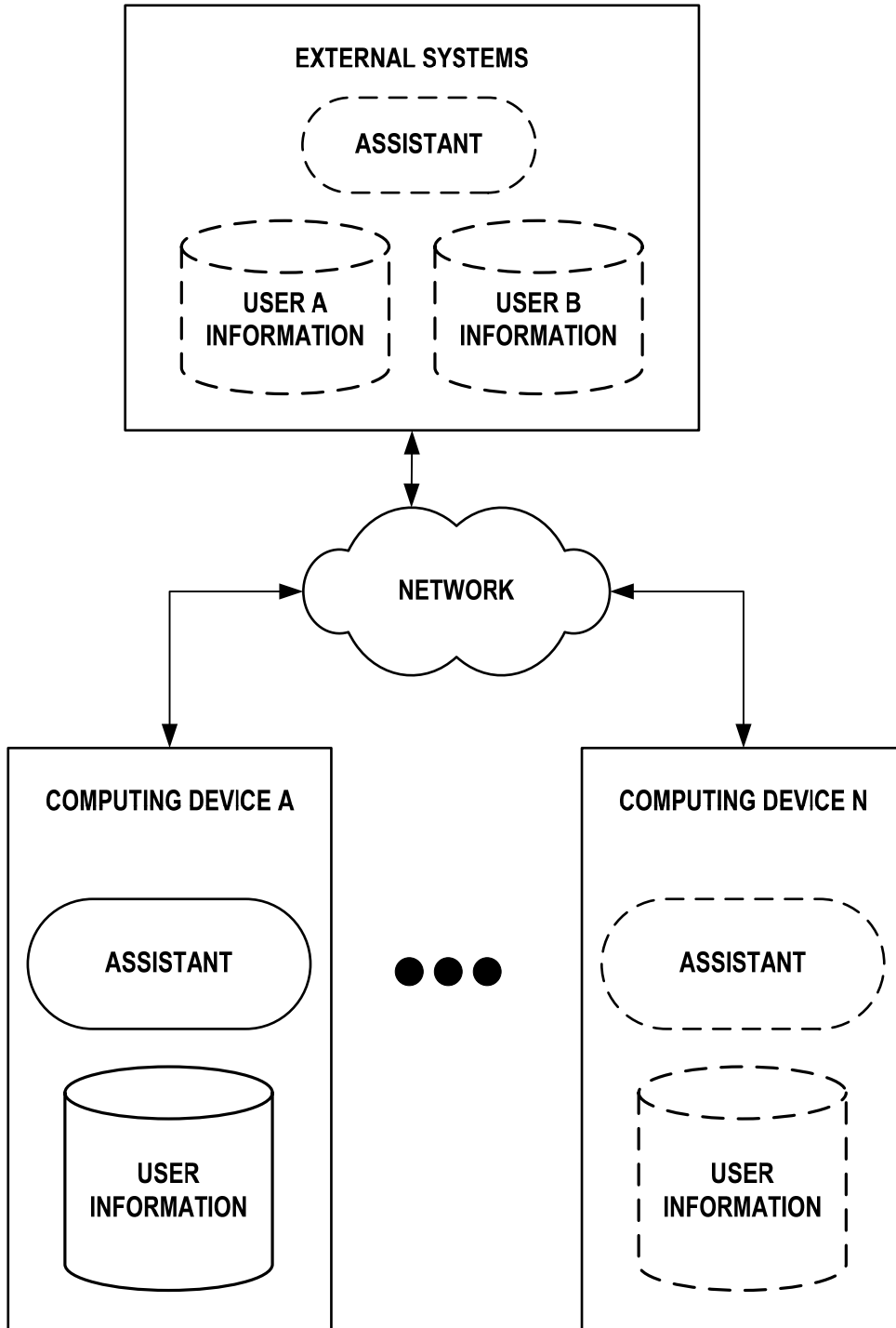
ASSISTANT

USER INFORMATION

FIG. 1

The system of FIG. 1 includes one or more external systems and computing devices A–N

communicating across a network with each of computing devices A–N executing an assistant

that performs operations involving groups of people. The network of FIG. 1 represents a combination of any one or more public or private communication networks, for instance, television broadcast networks, cable or satellite networks, cellular networks, Wi-Fi networks, broadband networks, and/or other type of network for transmitting data (e.g., telecommunications and/or media data) between various computing devices, systems, and other communications and media equipment. Computing devices A–N represent any type of computing device, cloud computing environment, server, or other system that is configured to execute an assistant and communicate on a network. The external systems represent any type of server or other computing system that is configured to support the assistants executing at computing devices A–N.

The external systems and computing devices A–N can be personal computing devices. In some examples, the external systems and/or computing devices A–N may be shared assets of multiple users. Examples of computing devices A–N include mobile phones, tablet computers, wearable computing devices, countertop computing devices, home automation computing devices, laptop computers, desktop computers, televisions, stereos, automobiles, and any and all other type of mobile and non-mobile computing device that is configured to execute an assistant. For example, computing device A may be a countertop assistant device and computing device N may be a mobile phone or automobile infotainment system.

An assistant executes across any combination of external systems one or more of computing devices A–N to provide assistant services to users of computing devices A–N. Examples of assistant services include: setting up reminders, creating calendar entries, booking travel, online ordering, sending messages or other communications, reading text aloud, controlling televisions, lights, thermostats, appliances, or other computing devices, providing

navigational instructions, or any other conceivable task or operation that may be performed by an assistant.

As a user interacts with the assistant, the assistant may obtain personal information about the user. Examples of personal information include: habits, voice samples, routines, preferences, notes, lists, contacts, communications, interests, assistant persona preferences, location histories, and other types of user information. After receiving explicit permission from the user, the assistant may store, the personal information at user information data stores and, in the course of providing assistant services, make use of the personal information stored at the user information data stores.

The external systems, computing devices A–N, and the assistant treat the information stored at the information stores so that the information is protected, encrypted, or otherwise not susceptible to unauthorized use. The information stored at the information data stores may be stored locally at each of computing devices A–N and/or remotely (e.g., in a cloud computing environment provided by the external systems and which is accessible via the network of FIG. 1).

Further to the descriptions below, a user may be provided with controls allowing the user to make an election as to both if and when the assistant, the computing device, or the computing systems described herein can collect or make use of supplemental data (e.g., user information or contextual information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if and when the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is

obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what supplemental data is collected about the user, how that supplemental data is used, and what supplemental data is provided to the user.

In operation, the assistant may monitor a user's rate of completion of a form. For instance, the assistant may monitor a user's rate of completion of the typical address and payment form shown in FIG. 2. The assistant may use a variety of metrics to measure the rate of form completion. Examples of metrics include, but are not included to, fields per unit time (e.g., 3 fields per 10 seconds), time per field (e.g., 10 seconds per field), characters per unit time (e.g., typing at 45 characters per minute), time between finishing a field until beginning a next field (e.g., the amount of time between when the last character is entered in the First Name field of FIG. 2 until the first character is entered in the Last Name field of FIG. 2), etc.

First Name	John
Last Name	Smith
Address	12
City	
State	
Zip Code	
Home Phone	
Mobile Phone	
E-mail Address	
Name on Card	
Card Type	
Card Number	
Exp. Date	

FIG. 2

If the rate of completion slows, the assistant can offer to aid the user in completing the form. For example, in FIG. 2 the user may begin completing the form by filling out the first name and last name fields at a rate of 5 seconds per field and then stop typing midway through filling out the address field (e.g., due to being annoyed at having to fill out the form). After enough time elapses without the user finishing the address field such that the rate of completion (e.g., time per field) decreases, the assistant may offer to complete the form. As one example, the assistant may verbally offer form completion aid (e.g., output synthesized speech saying "would you like me to finish filling this out for you"). As another example, the assistant may output a graphical user interface (GUI) that includes a written offer for form completion aid.

If the user accepts the assistant's offer, the assistant may finish filling out the form. For instance, to continue with the previous example, the assistant may finish filling out the address and payment form as shown in FIG. 3.

First Name	John
Last Name	Smith
Address	1234 Main Street
City	Anytown
State	MN
Zip Code	55347
Home Phone	(651) 555-1234
Mobile Phone	(651) 555-4321
E-mail Address	John.smith@example.com
Name on Card	John Smith
Card Type	SpecialCard
Card Number	7978-64614-246916519
Exp. Date	January 2025

FIG. 3

The assistant may fill out the forms using data from a wide variety of sources. As one example, the assistant may fill out the form using automatically acquired (with user permission) user data. As another example, the assistant may fill out the form using data expressly provided by the user (e.g., for creation of a user profile).

While described above as selectively offering form completion assistance based on completion rate, the assistant may selectively offer form completion assistance based on other

factors. As one example, the assistant may selectively offer form completion assistance based on a number of errors in completing the form. For instance, if the user has made more than a threshold number of errors (e.g., greater than 2, 3, 4, 5, etc. errors), the assistant may selectively offer form completion assistance. As another example, the assistant may selectively offer form completion assistance based on an error rate (e.g., errors per number of fields, such as a 10% error rate would indicate one error per every ten fields) in completing the form. For instance, if the user's error rate is greater than a threshold error rate (e.g., 5%, 10%, 20%, 50%, etc.) the assistant may selectively offer form completion assistance. In either case, the assistant may determine whether or not a user has made an error by comparing information entered into the form by the user with information about the user known to the assistant.

Adding an appointment to a calendar may be considered another example of filling out a form for which the assistant may selectively offer completion assistance. For instance, adding an appointment may involve the assistant asking 1: what day? 2: what time? 3: when does it end? 4: what's it called? 5: do you want a reminder?, etc. In this case, the assistant may observe the user's response rate (i.e., completion rate) and selectively offer assistance if the response rate drops too low. For instance, if the user has already provided the event name day and time (e.g., responded to "what day" "what time" and "what's it called") and is taking a long time to respond to "when does it end," the assistant may offer to complete adding the appointment automatically. As one example, the assistant may determine a duration of the event (e.g., based on the user's response to "what's it called") and set the end time (e.g., infer a response to "when does it end") based on the determined duration and the provided start time. As another example, the assistant may determine whether or not the user would like a reminder based on the user's history. For instance, if the user usually requests reminders for events with similar names and/or events at similar times, the assistant may infer that the user wants a reminder.

In some examples, as opposed to or in addition to the assistant offering to fill out the form, the user may proactively request that the assistant fill out the form. The user may request that the assistant fill out the form before the user has completed (or even started completing) any fields in the form. Alternatively, the user may request that the assistant fill out the form after the user has already completed some fields (or started to complete a field) of the form.

By selectively offering aid in completing forms, that assistant may balance the contradictory goals of not interfering with user actions (e.g., by not automatically asking when the user plans to fill out the form themselves) and simplifying the user experience (e.g., by still offering assistance based on the completion rate). The above examples are just some use cases for the assistant architecture shown in FIG. 1, the assistant architecture has many other applications and use cases.