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PROACTIVE ASSISTANCE FOR A PREDICTED DESTINATION

Google Inc.

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ABSTRACT

A virtual, intelligent, or computational assistant (e.g., also referred to simply as an "assistant") is described that relies on supplemental data (e.g., contextual information, user information, etc.) to predict a user's destination and offer to assist the user with actions the user will likely want to take at the predicted destination. With explicit permission from a user, the assistant may access a user's location history, calendar, e-mail, messages, past assistant interactions, contacts, photos, search history, sensor data, and other contextual or user information to predict a destination of a user as well as actions the user will likely want to take at the destination. The supplemental data can be stored locally on a device that is executing the assistant or in a cloud computing environment that is accessible to the assistant from the device. This way, the assistant is enabled to proactively offer assistance to a user when he or she will most likely need it, without requiring the user to consider requesting such assistance.

DESCRIPTION

Virtual, intelligent, or computational assistants (e.g., also referred to simply "assistants") execute on counter-top computing devices, mobile phones, automobiles, and many other types of computing devices. Assistants output useful information, responds to user queries, or otherwise perform certain operations to help users complete real-world and/or virtual tasks. The usefulness of an assistant may depend on what the assistant can infer about its users given what information the assistant already knows about its users and what additional information the assistant can access about the users.

The example system shown in FIG. 1 provides an assistant architecture that relies on supplemental data, including contextual information and user information, to predict a user's destination and offer to assist the user with actions the user will likely want to take at the predicted destination. That is, with explicit permission from a user, the assistant may access a user's location history, calendar, e-mail, messages, past assistant interactions, contacts, photos, and other contextual or user information that is outside the assistant's typical control to predict a destination of a user as well as actions the user will likely want to take at the destination. In other words, the assistant may rely on supplemental data from external data sources to proactively offer assistance when the user will most likely need it. The supplemental data can be stored locally on a device that is executing the assistant or in a cloud computing environment that is accessible to the assistant from the device. This way, the assistant is enabled to proactively offer assistance to a user when he or she will most likely need it, without requiring the user to consider requesting such assistance.

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 user information (e.g., 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 information is collected about the user, how that information is used, and what information is provided to the user.

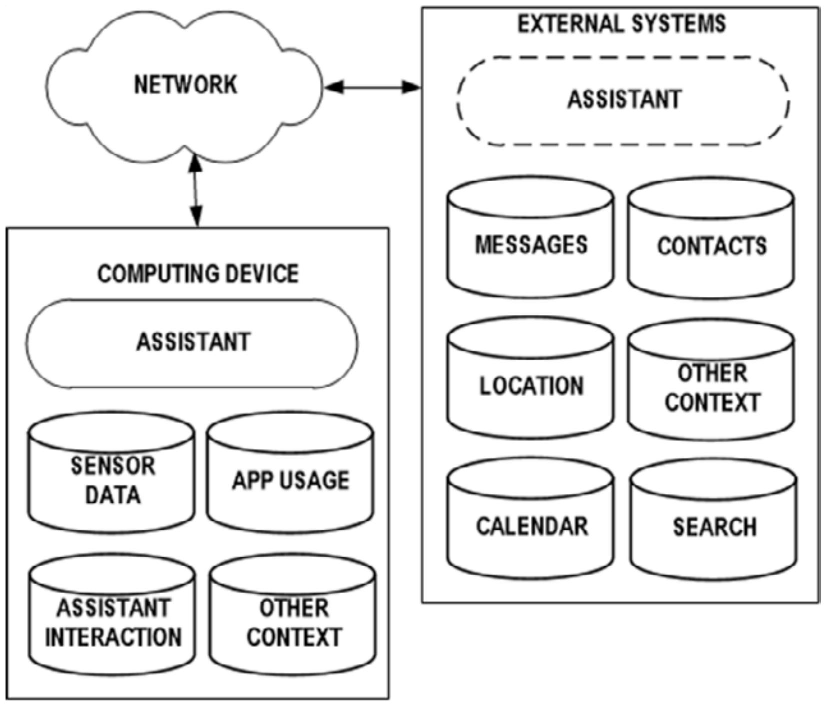

FIG. 1

The system of FIG. 1 includes one or more external systems and a computing device communicating across a network to provide an assistant service that maintains and has access to user information. 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.

The computing device represents any type of computing device 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 assistant's executing at the computing device. The external systems and computing device can be personal computing devices. In some examples, the computing device and external systems may be shared assets of multiple users. Examples of the computing device and the external systems include cloud computing environments, mobile phones, tablet computers, wearable computing devices, countertop computing devices, home automation computing devices, laptop computers, desktop computers, televisions, stereos, automobiles, and all other type of mobile and non-mobile computing device that is configured to execute an assistant.

The computing device and external systems may store or provide access to supplemental data including personal information about users. Examples of personal information include: sensor data, calendars, location histories, search histories, messages, e-mails, preferences, notes, lists, contacts, other communications, interests, application usage data, past assistant interactions, etc. After receiving explicit permission from a user, the computing device and external systems may store the supplemental data and enable an assistant, or other applications, executing at the computing device and external systems to access the supplemental data.

The external systems and the computing device treat the supplemental data so the supplemental data is protected, encrypted, or otherwise not susceptible to unauthorized access or unauthorized use. The supplemental data may be stored locally at the computing device 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).

The computing device includes an assistant that executes across the external systems and the computing device to provide assistant services to users of the computing device. Examples of assistant services include: setting up reminders, creating calendar entries, booking travel, online ordering, sending messages or other communications, 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. The assistant relies on the supplemental data stored on the computing device or the external systems when predicting a user's destination and proactively offering the user assistance with actions the user will likely want to take at the predicted destination.

As one example, as a user of the computing device is walking, the assistant may monitor location information, location history, time of day, and other supplemental data to infer that the user is taking a regularly traveled route for this time of day and is therefore heading to a particular café. The assistant may prompt the user "it looks like you're heading to the café, would you like me to place your regular order there for takeout?" If the user replies affirmatively, the assistant may place an online order at the café with a requested pickup time that corresponds to the user's estimated time of arrival. In some examples, the assistant may prompt the user to confirm the assumption before recommending an action. For example, the assistant may ask the user, "am I correct to assume you're heading to the café?" and if the user replies affirmatively, the assistant may offer to perform an action.

As another example, the user may be in her car. The assistant may again monitor supplemental data such as location information, location history, time of day, calendar, etc. and infer that the user is driving towards a school at the time school ends and therefore infer that the user is heading to her child's school. The assistant may prompt the user "you appear to be on your way to pick up Jonny, should I text him to let him know you'll be five minutes late as the traffic right now is a little higher than usual." If the user replies "yes", the assistant may automatically send a text message from the user's account and to her son's account that lets her son know she might be late.

As another example, the user may be in a conference room at work. The assistant may again monitor supplemental data such as location information, location history, time of day, calendar, ambient audio, and other supplemental data and infer that the user is alone, waiting for a meeting she organized to start. The assistant may prompt the user "I get the sense that the participants for your pitch are all late – should I send a reminder e-mail to each of the participants that your meeting is scheduled to start?" If the user replies "yes", the assistant may cause a meeting reminder notification to be transmitted to a respective computing device of each of the participants.

As another example, the user may be driving. The assistant may again monitor supplemental data such as e-mail, messages, location information, location history, time of day, calendar, and other supplemental data and infer that the user has a flight leaving soon but is driving the wrong way to the airport. The assistant may prompt the user "If you're heading to the airport, you are going the wrong way – would you like me to find the quickest way to get you going in the right direction?" If the user replies "yes", the assistant may provide the user with navigation instructions to the airport from the user's current location.

As another example, the assistant may infer that the user has a flight leaving soon but has already driven past the rental car return and the car the user is driving has less than a full tank of gas. The assistant may prompt the user "I'm thinking you're looking for a gas station to fill up before you drop off the car, right? Would you like directions to the nearest station?" If the user replies "yes", the assistant may provide the user with navigation instructions to a gas station.

By relying on supplemental data, the assistant is enabled to predict a destination a user is heading and proactively offer assistance to the user for when he or she arrives at the destination, without requiring the user to consider requesting such assistance. 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.