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ASSISTANT WITH HISTORICAL LOCATION BASED TRIGGERS

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ABSTRACT

A virtual, intelligent, or computational assistant (e.g., also referred to simply as an "assistant") is described that performs actions based on an inferred user location, user direction of movement, and/or historical actions performed for previous locations or directions of movement. In some implementations, a user may explicitly command the assistant to perform a particular action when the user is moving relative to, or at, a particular location. In other implementations, the assistant may learn what actions the user performs or causes the assistant to perform when the user is moving relative to, or at, a particular location. In either case, the assistant may monitor location or movement information of the user (e.g., a location history, a current location, etc.) and perform the requested or learned action when the current location or movement information matches the commanded or learned behavior. This way, the assistant is enabled to trigger performance of previously defined actions or tasks based on changes in user's future location or future movement.

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 information the assistant already knows about its users or what information the assistant has access to.

The example system shown in FIG. 1 provides an assistant architecture that described that performs actions based on an inferred user location, user direction of movement, and/or historical actions performed for previous locations or directions of movement. In some implementations, a user may explicitly command the assistant to perform a particular action when the user is moving relative to, or at, a particular location. In other implementations, the assistant may learn what actions the user performs or causes the assistant to perform when the user is moving relative to, or at, a particular location. In either case, the assistant may monitor location or movement information of the user (e.g., a location history, a current location, etc.) and perform the requested or learned action when the current location or movement information matches the commanded or learned behavior. This way, the assistant is enabled to trigger performance of previously defined actions or tasks based on changes in user's future location or future movement.

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.

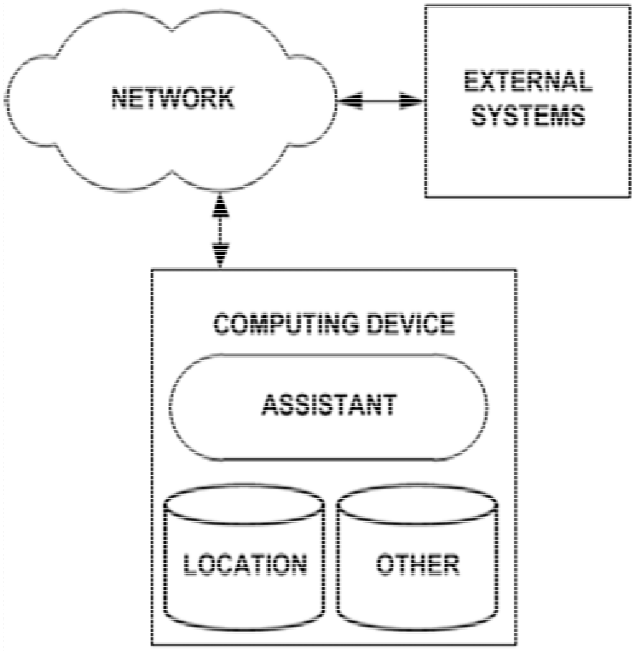

FIG. 1

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 assistants 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, in particular location and movement information, about users. Examples of supplemental data 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 hacking 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 interpreting, and determining answers to, user queries.

As one example, a user of the computing device (e.g., a mobile phone, an automobile, etc.) may command the assistant to "turn on the hot tub 20 minutes before I arrive home". The assistant may generate a one-time task to send a control command to a control unit of the user's hot tub. The task may specify transmitting the control command when the user's expected arrival time at his home location is within twenty minutes. The assistant may continuously monitor the location of the user (e.g., the location of the mobile phone, the location of the user's automobile, etc.) until the assistant determines that the user is traveling in a direction towards his or her house. The assistant may compute the estimated arrival time of the user and when the estimated arrival time is approximately 20 minutes, the assistant will send the control command to cause the hot tub to turn-on.

If the user commands the assistant to control his or her hot tub in a similar way in the future, the assistant may generate a recurring rule to always turn on the hot tub 20 minutes before the user arrives home. In other words, the assistant may infer from past user behavior what types of location or movement triggered actions to take and when future locations or movements of the user mimic the past behaviors, the assistant will perform the actions.

As another example, the user of the computing device may command the assistant to "open the garage door when I'm driving home from the grocery store but not from other locations." The assistant may generate a recurring task or rule for sending a control command to

a control unit of the user's garage door opener. The task may specify transmitting the control command when the user begins traveling from a grocery store location in the direction of his or her home. The assistant may continuously monitor the location of the user. The assistant determines whether the user is at the grocery store location and if so, whether the movement information indicates he or she is traveling in a direction towards his or her house. If the user is at the grocery store location and traveling home, the assistant will send the control command to the control unit of the garage door opener. If however, the user is not traveling home from the grocery store location, or is traveling home from some other location, the assistant will refrain from causing the garage door to open.

Similar the hot tub example above, the assistant may infer without explicit user command, and from past garage door behavior what types of location or movement information the assistant should use to trigger opening the garage door. For example, the assistant may learn that the user always opens the garage door when traveling home from the grocery store but not from other locations. The assistant may execute a rule that automatically causes the garage door to open whenever the assistant determines the user is on his or her way home from the grocery, but not other, store.

As another example, the user may command the assistant to "let my wife know when I've left work". The assistant may generate a recurring task or rule for sending a text message to the user's wife. The task may specify transmitting the text message when the user begins traveling from a work location. The assistant may continuously monitor the location of the user. The assistant determines whether the user is leaving the work location (e.g., when after connecting to a Bluetooth receiver in the user's car that is parked in a parking lot of the work location, the location or movement information indicates that the user is moving in a car). If the assistant

determines that the user is leaving work, the assistant will send a text message to the user's wife that lets her know the user has left work. In some examples, the assistant may rely on other information beyond just location and movement to trigger a task. For instance, the assistant may rely on time of day. If the assistant determines the user has left work during a lunch hour, the assistant may refrain from sending the text message to the user's wife since the user is likely just getting lunch and going back to work. If however the assistant determines the user has left work at the end of the day, the assistant may send the text message to the user's wife since the user is likely leaving work.

As one final example, the assistant, again with explicit permission from users of the assistant, may monitor locations of others to trigger tasks to perform for a user. For example, the user may command the assistant to "tell my son to call me before he starts driving home from practice." In this example, the assistant will have previously obtained explicit permission from the son and the user (e.g., the mom) to monitor the son's location on behalf of the user. The assistant may generate a onetime task or rule for outputting a notification via the son's phone to call his mother. The task may specify outputting the notification when the user is in a parking lot at a practice location. Then, the assistant may monitor the son's location and infer when the location indicates he is at practice location. The assistant may infer from movement information obtained from the son's phone that the son is walking in a parking lot and in response, cause the son's mobile phone to output a notification for calling his mother.

By triggering its performance of certain actions or tasks to past user behaviors and location and movements of a user, the assistant can better assist the user at a moment when the user is likely to need the assistance. That is, rather than simply tie performance of a task to a certain time of day or other parameter, the assistant can further tie performance of the task to a

location or movement thereby improving the chance that the task will be performed, when the user wants it performed. Further, the assistant can automatically learn what actions the user prefers to be taken at various locations and movements and automatically take those actions without requiring the user to explicitly command the assistant to take the actions. 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.