ASSISTANT RECOMMENDED PURCHASES BASED ON RECURRING USER BEHAVIOR

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ASSISTANT RECOMMENDED PURCHASES
BASED ON RECURRING USER BEHAVIOR

ABSTRACT

A virtual, intelligent, or computational assistant (e.g., also referred to simply as an “assistant”) is described that recommends purchases based on recurring user behavior. The assistant monitors shopping lists of its users to determine which items get added to the shopping lists and under what circumstances. The assistant monitors other user behavior, particularly with regards to purchases made (e.g., when, where, and under what circumstances) and develops rules for predicting what items the users will want to purchase and under what conditions. The assistant outputs recommendations based on the rules for adding predicted items to shopping lists. In some implementations, the assistant is configured to determine when and if to set up recurring orders, and to suggest or create a schedule for such orders, for some items based on the developed rules to free users from having to remember to manually purchase items. This way, the assistant automatically recommends items the assistant predicts the users will need, when the assistant predicts that the users will need them.

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 users’ needs, or otherwise performs certain operations to help users complete real-world and/or virtual tasks. Some assistants are configured to record shopping lists that each user can later retrieve or modify during subsequent interactions with the assistant. While providing a user interface for creating a
shopping list via an assistant may be somewhat useful (e.g., as the user may tell the assistant what he or she needs to buy as opposed to writing or typing out each item), the user still has to recall and provide as some sort of input to the assistant, each item that he or she wants included on the shopping list, the same way he or she would create a shopping list by writing or typing the list by-hand.

The example system shown in FIG. 1 provides an assistant architecture that monitors past user behavior and automatically recommends items that the assistant predicts the user would want to purchase and/or include in a shopping list. In some cases, the assistant recommends creating a recurring order to free the user from having to remember to manually purchase the items. For example, if, while processing an instruction from the user to add certain items to a shopping list, the assistant determines that the user would likely want to add other items to the shopping list, the assistant may recommend adding the other items to the shopping list on the user’s behalf. In some cases, with explicit permission from the user, the assistant may even make purchases on the user’s behalf. The assistant therefore makes purchasing or planning a shopping trip easier by either automatically ordering items on the user’s behalf or automatically recommending items to include in a shopping list, without requiring the user to remember to add them.
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 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, corporate, or government owned computing devices. In some examples, the computing device may be a shared asset of multiple users. Examples of the computing device include servers, mainframes, 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 any and all other type of mobile and non-mobile computing device that is configured to execute an assistant.

The computing device includes a context identifier for processing and analyzing contextual information associated with the computing device (i.e., information about user behavior) to define a context. The context specifies characteristics of the computing device’s and/or user’s physical and/or virtual environment. For example, the context identifier might determine, as part of a context, weather conditions at a physical location of the computing device or user at a particular time. The types of information that define a context are too numerous to list. As some examples, a context may specify: physical location, speed, weather conditions, calendar information, application usage (e.g., text entries made in data fields of webpages, search or browsing histories, and other application usage data), audible or visual aspects of the environment of the computing device, or any and all other types of characteristics of the physical or virtual environment of the computing device or user. After receiving explicit consent from a user, the context identifier may maintain past and future contextual histories associated with the user of the computing device as personal information. The assistant may make use of purchasing rules developed based on the contextual histories created by the context identifier.

The computing device further 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.
As a user interacts with the assistant, the assistant may obtain personal information about the user including a context of the user as determined by the context identifier. Examples of personal information include: habits, preferences, notes, lists, contacts, communications, interests, 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 and the computing device treat the information stored at the information stores so that the information is protected, encrypted, or otherwise not susceptible to hacking or unauthorized use. The information stored at the information data stores 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 assistant stores and organizes user created information, such as shopping lists, memos, notes, and reminders, on behalf of the user of the assistant. The assistant recommends purchases based on recurring user behavior. The assistant monitors shopping lists of its users to determine which items get added to the shopping lists and under what circumstances (e.g., given what contexts). The assistant monitors other user behavior, particularly with regards to purchases made, and develops rules for predicting what items the users will want to purchase and when. In some implementations, the assistant is configured to determine when and if to set up recurring orders, and to suggest or create a schedule for such orders, for some items based on the develop rules to free the user from having to remember to manually purchase the items. The assistant outputs recommendations for adding predicted items to a shopping list. This way, the
assistant automatically recommends items the assistant predicts the users will need, when the assistant predicts that the users will need them.

The assistant uses a learning model (e.g., machine-learning techniques) that monitors user behavior and context to develop rules for predicting, based on the user’s past behavior, what items a user may want to purchase and when. That is, the assistant may identify patterns in user purchases and correlate the purchasing patterns to user behaviors or the context of the computing device when the purchases were made. While generally applicable to any type of item, the following examples are generally described with a focus on grocery lists and purchasing grocery items. However, the following examples and techniques apply for any type of purchasing environment including grocery, non-grocery, residential, and non-residential (e.g., commercial, governmental, etc.) settings.

As one example, the learning model may identify milk and bread on the user’s grocery list for each of the past six weeks. Accordingly, the learning model may create a rule that causes the assistant always recommend adding milk and bread a user’s grocery list. After observing the user’s purchasing habits throughout the year, the learning model may observe that whenever the weather starts to turn cold, a user’s grocery list includes tea and instant soups, whereas whenever the weather starts to turn warm, the user’s grocery list includes peaches and summer ale with some frequency. The learning model may create a rule used by the assistant for always recommending soups and tea in the winter and peaches and summer ales in the summer.

Using the rules generated based on user behavior, the assistant outputs recommendations to the user for including certain items on a shopping list or in some examples, the assistant even offers to establish recurring orders based on the rules. The assistant allows the user to have the ultimate control however over what is included in a shopping list or what is actually ordered.
The learning model may modify the rules used by the assistant as user behavior changes. For example, after observing that a user routinely ignores a recommendation to add milk to a shopping list, the learning model may adjust or delete a rule so that milk is no longer recommended, or is recommended with less frequency whenever a shopping list is created. As another example, if a user goes on a diet to lose weight and stops purchasing junk food, the learning model may observe that chips and snack recommendations are ignored by the user and the user manually adds more fruits and vegetables to their shopping lists. The learning model may modify its rules so the assistant stops recommending unhealthy items and instead recommends the user’s favorite (or more frequently purchased) fruits and vegetables.

By learning the shopping habits of a user, the assistant makes planning future shopping or making purchases in accordance with past shopping habits easier and less time consuming for the user. 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.