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(54) **RESOURCE CONFIGURATION IN MULTI-MODAL DISTRIBUTED COMPUTING SYSTEMS**

(75) Inventors: **Ponani Gopalakrishnan**, New Delhi (IN); **Stephane H. Maes**, Fremont, CA (US); **Ganesh N. Ramaswamy**, Ossining, NY (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

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G10L 15/00 (2006.01)

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(58) **Field of Classification Search** 713/100; 704/231

See application file for complete search history.

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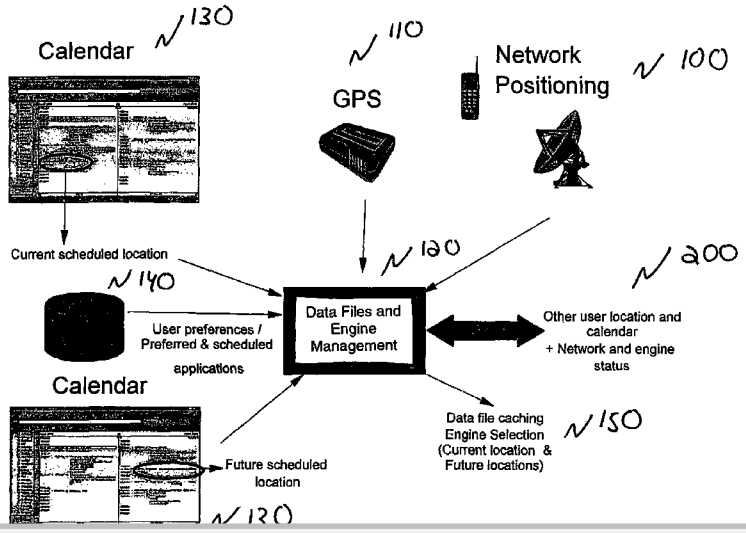
Primary Examiner—Thomas Lee
Assistant Examiner—Vincent T Tran
(74) *Attorney, Agent, or Firm*—Ference & Associates LLC

(57) **ABSTRACT**

A method and system for configuring available resources in real-time to automatically accommodate the needs of the system user in multi-modal distributed computing system is disclosed. Information about the location or environment of a wireless device is used, preferably in combination with user personal preferences and past history to modify the behavior of the wireless device, including the selection of the most appropriate mode of interaction with the device and the activation of applications thereon as appropriate.

21 Claims, 2 Drawing Sheets



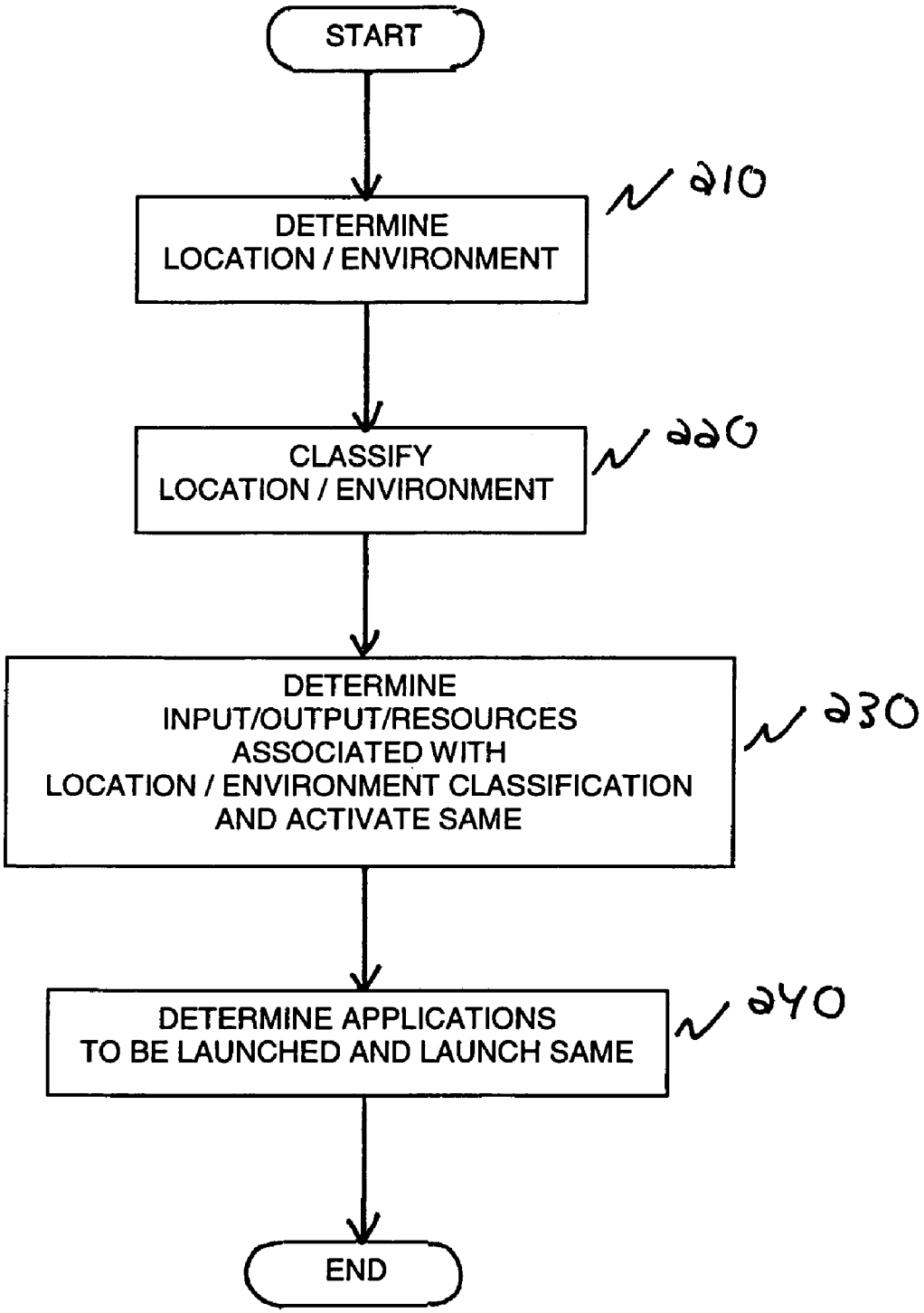


Fig. 1

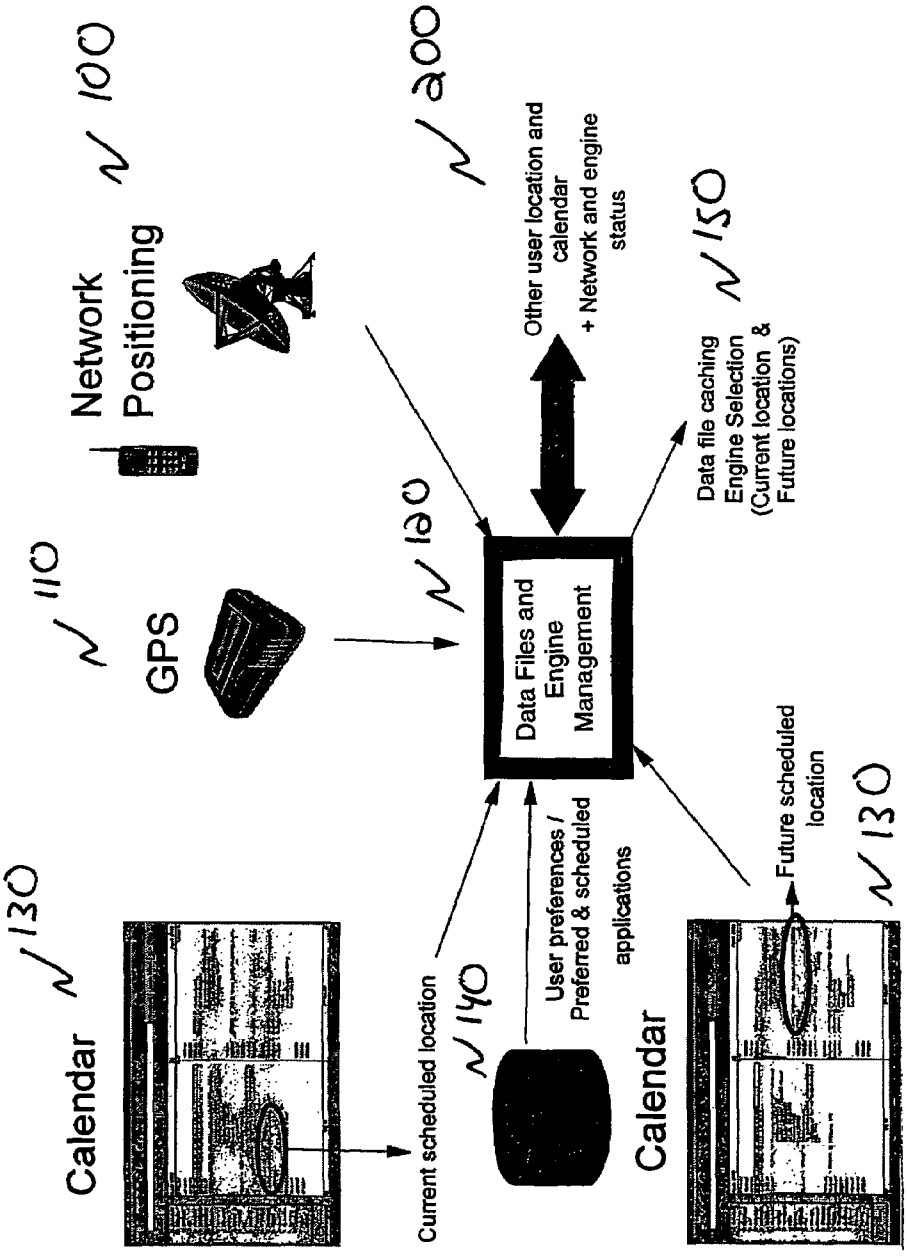


Fig. 2

RESOURCE CONFIGURATION IN MULTI-MODAL DISTRIBUTED COMPUTING SYSTEMS

FIELD OF THE INVENTION

The present invention relates to multi-modal distributed computing systems and, more specifically, to configuring available resources in real-time to automatically accommodate the needs of the system user.

BACKGROUND OF THE INVENTION

There are many types of wireless mobile devices being used in the world today including mobile phones, personal digital assistants ("PDAs"), hand-held devices, and combinations of these devices. Wireless transport networks and wireless local area networks allow electronic content to flow to and from these mobile devices. With the growing popularity of mobile devices, mobile information access and remote transactions are fast becoming commonplace. However, mobile devices impose their limitations on the end user experience. For example, mobile phones have relatively small visual displays and a cumbersome keypad input. PDAs have better visual displays, but have the same input limitations. As devices become smaller, modes of interaction other than keyboard and stylus are a necessity. One such alternative is the use of multimodal access methods.

Multichannel access is the ability to access enterprise data and applications from multiple methods or channels such as a phone, laptop or PDA. The term "channel" refers to the different browsing platforms or user agents that access, browse, and interact with online applications. Multichannel applications are designed for universal access across different channels, one channel at a time, with no particular attention paid to synchronization or co-ordination among the different channels. A user has an array of channels with which to access content, which appears separate but functional and consistent. For example, a user may access his or her bank account balances on the Web using Microsoft® Internet Explorer when in the office or at home and may access the same information over a dumb phone using voice recognition and text-to-speech when on the road.

By contrast, multimodal access is the ability to combine multiple modes or channels in the same interaction or session. The methods of input include speech recognition, keyboard, touch screen, and stylus. Depending on the situation and the device, a combination of input modes will make using a small device easier. For example, in a Web browser on a PDA, a user can select items by tapping or by providing spoken input. Similarly, a user can use voice or stylus to enter information into a field. With multimodal technology, information on the device can be both displayed and spoken. This can be especially important in automobiles or other situations where hands and eyes free operation is essential.

Multimodal applications represent the convergence of content—video, audio, text and images—with various modes of user interface interaction. This enables a user to interact with an application in a variety of ways, for example: input with speech, a keyboard, keypad, mouse and/or stylus, and output such as synthesized speech, audio, plain text, motion video and/or graphics.

The term "mode" denotes a mechanism for input and output to a user interface. A user can employ each of these modes independently or concurrently. Multimodal applications

number from a wireless handset—all within the same session, form, and application context. The browser will typically let a user select the most appropriate mode of interaction based on the user's situation, activity, or environment.

The different modes may be supported on a single device or on separate devices working in tandem. When separate devices work in tandem, this is typically referred to as distributed multi-modal computing. An example of distributed multi-modal computing is a user is talking into a cell phone and seeing the results on a PDA. Voice may also be offered as an adjunct to browsers with high resolution graphical displays, providing an accessible alternative to using the keyboard or screen.

Multimodal applications are an improvement over multichannel applications. Advantages of multimodal applications include: multimodal interfaces improve the usability of data services such as weather, driving directions, stock quotes, personal information management, and unified messaging; Application Service Providers can offer users a wider range of personalized and differentiated offerings using multimodal interfaces; many call center applications and enterprise data services such as account management, brokerage accounts, customer service, and sales force automation offer voice-only interfaces and multimodal interfaces added to these applications enhance a users experience; with multimodal interfaces, a user can easily access and enter information, especially when using small devices by combining multiple input and output devices; multimodal applications improve a users experience with mobile devices and encourage the growth and acceptance of m-Commerce; a user need not be constrained by the limitations of a particular interaction mode at any given moment, for example, while listening to instructions on a Voice browser, a user is constrained by the ephemeral nature of the interface; a user may wish to listen to the instructions again; multimodal interfaces give a user the flexibility to choose the most convenient interaction mode that suits the task and purpose; they can also exploit the resources of multiple interfaces in order for a user to have an enhanced computing experience.

Users of multimodal interfaces, however, do face certain issues. These issues include ergonomic issues and appropriateness. Ergonomic issues may arise as a user switches from one mode to another, such as alternating between listening and watching. Appropriateness issues are in the nature of a user disabling speech input and output when this would be distracting to nearby people. Considering all of the various issues, however, a user must still select the most appropriate mode of interaction based on the user's situation, activity, or environment.

SUMMARY OF THE INVENTION

In accordance with at least one presently preferred embodiment of the present invention, there is broadly contemplated a system and method in which information about the location or environment of a wireless device is used, preferably in combination with user personal preferences and past history, to modify the behavior of the wireless device.

In summary, one aspect of the invention provides a system for system for resource configuration in a multi-modal distributed computing system having at least one resource capable of being configured, the system comprising: an arrangement for obtaining information associated with a

for configuring said at least one resource based upon the information associated with the mobile device and the system.

Another aspect of the present invention provides a method for resource configuration in a multi-modal distributed computing system having at least one resource capable of being configured, the method comprising the steps of: obtaining information associated with a mobile device within the system; obtaining information associated with the system; configuring said at least one resource based upon the information associated with the mobile device and the system.

Furthermore, an additional aspect of the invention provides a program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform a method for resource configuration in a multi-modal distributed computing system having at least one resource capable of being configured, the method comprising the steps of: obtaining information associated with a mobile device within the system; obtaining information associated with the system; configuring said at least one resource based upon the information associated with the mobile device and the system.

For a better understanding of the present invention, together with other and further features and advantages thereof, reference is made to the following description, taken in conjunction with the accompanying drawings, and the scope of the invention will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a flow chart of a method in accordance with the present invention.

FIG. **2** is a block diagram of the implementation of a system in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the present invention, information about the location or environment of the wireless device is used, preferably in combination with user personal preferences and past history to modify the behavior of the wireless device, including the selection of the most appropriate mode of interaction with the device and the activation of applications thereon as appropriate.

The environment the wireless device is located in may be established in a number of ways, and may include the actual physical location of the device or the location of the device relative to other devices, resources, etc. For example, a number of wireless devices now include the ability to determine its position using the Global Positioning System (GPS). In fact, the use of GPS is mandated for certain wireless devices by the United States Government, e.g., cell phones. The environment of the device may also be established based upon the proximity to or use by the device of a wireless network. For example, by the wireless device entering a local network (e.g., a Bluetooth piconet). The location of the wireless device may also be based upon a scheduled future location. It should be understood the present invention includes the use of establishing the location of the wireless device in any manner, and not just in accordance with the examples set forth herein.

Once the environment the wireless device is located in has been established, the behavior of the wireless device is appropriately modified. Behavior may be modified in any number whether or not a user has indicated that a certain modification, whether it be the launch of an application or otherwise, is to occur at a particular moment. The second is the preference of the user, as determined through past instructions as well as the history of the modifications, including applications and queries, that were launched by the user in the same or similar location.

Given the number of environments a wireless device may encounter over time, it is presently preferred that any past instructions and historical modifications be associated with the following specific situations: Office, Local on the road, Remote business site, Local business office, Teleconference, Conference room, Commute, On the road between business office and remote business site, Business trip, and Abroad. It should be understood, however, that past instructions and historical modifications may be associated with any number of situations, including particular situations favored by a user. Association with specific situations may be accomplished without user intervention, either by the wireless device itself or otherwise. In any event, it is presently preferred that a user's ability to associate an environment with a specific situation not be precluded.

The preference of the user may also be determined exclusively through the use of historical data without reference to an association to any specific situation. Doing so, however, increases the computational resources needed at the triggering event to determine the appropriate modifications to the behavior of the wireless device. Given the nature of mobile wireless devices, the availability of computational resources may very well be at a premium.

As discussed herein, the information interaction needs of a user in a multi-modal distributed computing environment are often influenced by the location, device, available resources and other environmental factors. The following are non-limiting examples of how such information interaction needs may be so influenced in accordance with the present invention. A user with an audio-only device such as a mobile phone may wish to temporarily use a display resource (such as a monitor in a lounge or a conference room, or an in-seat display on an aircraft) to look at video information. A user driving a car may be interested in getting some traffic or weather information, and may be interested in getting the information downloaded to an accessible device or may wish to make reservations for network resources to access the information. A user entering a new building may wish to have information such as restroom locations downloaded to a personal device immediately upon entrance. A traveler entering the airport check-in may wish to have information about departure gate changes downloaded to an accessible device. A user may wish to have only urgent messages made available (by email or otherwise) when the user is travelling, but want to have all messages made available when not travelling. Similarly, a user may want to skip over any messages containing material if the user is in a public place. A user may desire a device with audio to be verbose outside of a vehicle, but not as verbose when the user is in a vehicle. There are also numerous other ways in which information interaction needs may be so influenced.

In another embodiment of the present invention, the behavior of the wireless device is appropriately modified based upon actions initiated by or preferences of others, such modification not having been selected by the user of the wireless device, e.g., the modification having been initiated externally of the wireless device being modified. Others may include other users of wireless devices within the environment or the

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