(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 June 2012 (21.06.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/082406 A2

(51) International Patent Classification:
G06F 9/44 (2006.01) *G06F 15/16* (2006.01)
G06F 3/14 (2006.01)

(21) International Application Number:
PCT/US2011/063099

(22) International Filing Date:
2 December 2011 (02.12.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/967,972 14 December 2010 (14.12.2010) US

(71) Applicant *(for all designated States except US)*: **MICROSOFT CORPORATION** [US/US]; One Microsoft Way, Redmond, WA 98052-6399 (US).

(72) Inventors: **CAMPBELL, John**; c/o Microsoft Corporation, LCA - International Patents, One Microsoft Way, Redmond, WA 98052-6399 (US). **LIN, Amy**; c/o Microsoft Corporation, LCA - International Patents, One Microsoft Way, Redmond, WA 98052-6399 (US). **WALDMAN, Lawrence**; c/o Microsoft Corporation, LCA - International Patents, One Microsoft Way, Redmond, WA 98052-6399 (US). **DER, Sherman**; c/o Microsoft Corporation, LCA - International Patents, One Microsoft Way, Redmond, WA 98052-6399 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM,

[Continued on next page]

(54) Title: LOCATION AWARE SPREADSHEET ACTIONS

(57) Abstract: Location information is integrated with spreadsheet formulas and operations. Location information may be used in filtering data, detecting data sources, performing calculations, and the like. The data may be filtered by location, individuals, places, and other location based information. The location information may be integrated into native spreadsheet formulas to perform calculations, trigger alerts, or drive other spreadsheet business logic. The location information may also be used to detect and use nearby data sources that are published near the spreadsheet user.

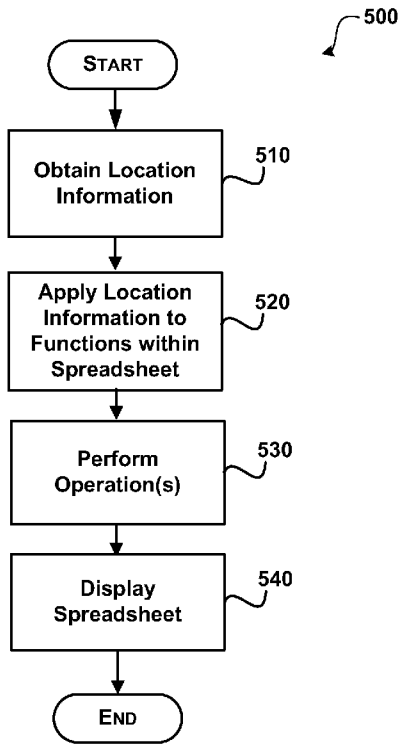

FIG. 5

WO 2012/082406 A2

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

LOCATION AWARE SPREADSHEET ACTIONS

BACKGROUND

[0001] Many people utilize spreadsheets to interact with data. Today, not only do users interact with spreadsheets using desktop computers but they also interact with spreadsheets using portable devices. For example, users may use their smart phone, laptops and tablets to interact with a spreadsheet.

SUMMARY

[0002] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0003] Location information is integrated with spreadsheet formulas and operations. Some examples of integrating location information include, but are not limited to, using location information in filtering data, detecting data sources, performing calculations, and the like. The data may be filtered by location, individuals present at a location, places, and other location based information. The location information may be integrated into native spreadsheet formulas to perform calculations, trigger alerts, or drive other spreadsheet business logic. The location information may also be used to detect and use nearby data sources that are published near the spreadsheet user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIGURE 1 illustrates an exemplary computing environment;

[0005] FIGURE 2 shows a system for location aware spreadsheet actions;

[0006] FIGURE 3 shows an example spreadsheet with location filtering on;

[0007] FIGURE 4 shows an example spreadsheet with a location filtering user interface; and

[0008] FIGURE 5 shows an illustrative process for integrating location information into spreadsheets.

DETAILED DESCRIPTION

[0009] Referring now to the drawings, in which like numerals represent like elements, various embodiment will be described. In particular, FIGURE 1 and the corresponding discussion are intended to provide a brief, general description of a suitable computing environment in which embodiments may be implemented.

[0010] Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types. Other computer system configurations may also be used, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, and the like. Distributed computing environments may also be used where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[0011] Referring now to FIGURE 1, an illustrative computer environment for a computer 100 utilized in the various embodiments will be described. The computer environment shown in FIGURE 1 includes computing devices that each may be configured as a server, a desktop or mobile computer, or some other type of computing device and includes a central processing unit 5 ("CPU"), a system memory 7, including a random access memory 9 ("RAM") and a read-only memory ("ROM") 10, and a system bus 12 that couples the memory to the CPU 5.

[0012] A basic input/output system containing the basic routines that help to transfer information between elements within the computer, such as during startup, is stored in the ROM 10. The computer 100 further includes a mass storage device 14 for storing an operating system 16, spreadsheet application 24, other program modules 25, and location manager 26 which will be described in greater detail below.

[0013] The mass storage device 14 is connected to the CPU 5 through a mass storage controller (not shown) connected to the bus 12. The mass storage device 14 and its associated computer-readable media provide non-volatile storage for the computer 100. Although the description of computer-readable media contained herein refers to a mass storage device, such as a hard disk or CD-ROM drive, the computer-readable media can be any available media that can be accessed by the computer 100.

[0014] By way of example, and not limitation, computer-readable media may comprise computer storage media and communication media. Computer storage media includes volatile and non-volatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. Computer storage media includes, but is not limited to, RAM, ROM, Erasable Programmable Read Only Memory ("EPROM"), Electrically Erasable Programmable Read Only Memory ("EEPROM"),

flash memory or other solid state memory technology, CD-ROM, digital versatile disks ("DVD"), or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by the computer 100.

[0015] Computer 100 operates in a networked environment using logical connections to remote computers through a network 18, such as the Internet. The computer 100 may connect to the network 18 through a network interface unit 20 connected to the bus 12. The network connection may be wireless and/or wired. The network interface unit 20 may also be utilized to connect to other types of networks and remote computer systems. The computer 100 may also include an input/output controller 22 for receiving and processing input from a number of other devices, including a keyboard, mouse, or electronic stylus (not shown in FIGURE 1). Similarly, an input/output controller 22 may provide input/output to an IP phone, a display screen 23, a printer, or other type of output device.

[0016] Carrier network 28 is a network responsible for communicating with mobile devices 29. The carrier network 28 may include both wireless and wired components. For example, carrier network 28 may include a cellular tower that is linked to a wired telephone network. Typically, the cellular tower carries communication to and from mobile devices, such as cell phones, notebooks, pocket PCs, long-distance communication links, and the like. Some of these communications may be messages. For example, a message may be a short message service ("SMS") message, an Enhanced Messaging Service (EMS) message, a multimedia messaging service ("MMS"), and the like. As used herein, the term "text message" refers to SMS messages, MMS messages and EMS messages and other types of short messages. Gateway 27 routes messages between carrier network 28 and IP Network 18.

[0017] As mentioned briefly above, a number of program modules and data files may be stored in the mass storage device 14 and RAM 9 of the computer 100, including an operating system 16 suitable for controlling the operation of a computer, such as WINDOWS SERVER® or the WINDOWS 7® operating system from MICROSOFT CORPORATION of Redmond, Washington. The mass storage device 14 and RAM 9 may also store one or more program modules. In particular, the mass storage device 14 and the RAM 9 may store one or more application programs, including a spreadsheet application 24 and program modules 25. Any spreadsheet application may be used. According to an embodiment, MICROSOFT EXCEL® is used.

[0018] Location manager 26 is configured to manage location information that is associated with a spreadsheet application, such as spreadsheet application 24. Location information may be obtained from one or more sources. For example, location information may be obtained from location sensor(s) 11 or from other location source(s). The location sensor(s) may be any sensor that provides location based information, such as a global positioning system (GPS). The location information may also be provided externally from the computing device. This location information may be an estimate of the location of the user (i.e. based on an IP address, a last known location, and the like) or more accurate information (i.e. location provided by cellular service). Generally, any method of determining location information may be used.

[0019] The location information may be used in spreadsheet application 24 for filtering data, detecting data sources, performing calculations, and the like. The data may be filtered by location, individuals, places, and other location based information. The location information may be integrated into native spreadsheet formulas to perform calculations, trigger alerts, or drive other spreadsheet business logic. The location information may also be used to detect and use nearby data sources that are published near the spreadsheet user.

[0020] FIGURE 2 shows a system for location aware spreadsheet actions. As illustrated, system 200 includes computing device 1 (240), computing device 2 (220), computing device 3 (230), service(s) 210 and data source(s) 250. Computing devices 1-3 are coupled through Network 201. Each of the computing devices includes a spreadsheet application that is location aware. While only computing device 1 is shown including location manager 244, each of the computing devices may include the functionality of a location manager. The location manager may be a part of a spreadsheet application or the functionality of the location manager may be external to the spreadsheet application. The computing devices may include other application programs that interact with a location aware spreadsheet application. For example, the computing devices may include an email program, a text messaging program, an instant messaging program, a web browser, a mapping program, a spreadsheet viewing program, and the like.

[0021] Location information may be provided to the computing devices by the use of location sensor(s), such as location sensor(s) 246 and/or through other methods. For example, a computing device could access a computing service, such as a location service provided by service(s) 210, to obtain location information (e.g. a cellular company provides the location to the device). A computing device may also estimate its location.

The location information may be estimated based on an IP address, a last known location, a user inputted location, and the like. According to an embodiment, a GPS sensor is used by a computing device to obtain location information.

[0022] Service(s) 210 may provided different services that may be utilized by the computing devices. The services may include a search service, a cloud based service (e.g. an online spreadsheet service), a location based service, or some other service. For example, a computing device, such as computing device 3 may access a spreadsheet that is stored in a data store of an online service.

[0023] The location aware spreadsheet, such as spreadsheet application 242, is configured to convert location information into other location representations. For example, GPS coordinates may be converted to a name of a place (i.e. street, building, county, city, state, country, park, and the like). The conversions may be performed local to the computing device and/or external to the computing device (i.e. a location based service is used).

[0024] The location aware spreadsheet application is also configured to determine a location of people. For example, the user of computing device 1 may store a list of people that they are interested in knowing the location of and sharing information with. The people to capture the location data of may be determined in many different ways. For example, determining names contained within a spreadsheet, determining names from a user-defined list, accessing contacts on the computing device, accessing contacts in an IM client, using other contact lists that are associated with the user, or through any software or hardware that keeps a list of contacts (e.g. social networking sites).

[0025] The locations of the people within the list may be provided through a location based service, a website, a cellular company, user inputted location information and the like. The location aware spreadsheet application may be notified when a person is within a designated area and/or provided with updates as the people move locations. Formulas to capture the location of other spreadsheet users may be done using a push or pull mechanism.

[0026] The location aware spreadsheet application is configured to automatically incorporate the location information such that users may more easily perform useful operations that are related to location context. A set of native location formulas 243 are used by location aware spreadsheet applications, such as spreadsheet application 242. The location formulas may comprise many different types of formulas. For example, a set of conversion formulas to convert location data from one type to another type (i.e. GPS to

city, building to GPS), formulas to obtain location information directly from the device and off of the device, formulas to locate other people, formulas to trigger spreadsheet operations, formulas for detecting data sources, user interface filtering and sorting formulas, user interface surfacing formulas and the like. For example, a location formula may specify that when a user is located in Oregon then a sum of three numbers within the spreadsheet is calculated and when the user is not in Oregon, then an average of a column number is calculated. The location formulas may be used with values/objects that are associated with a spreadsheet.

[0027] A data source to connect to may also be specified. For example, a user interface may be used to present available data sources and connect to one or more of the available data sources. The data sources may be presented within a user interface when the data sources become available (e.g. data source is near user's current location).

[0028] The formulas to trigger actions based on location data are configured to perform some operation(s) upon the location information satisfying a predefined condition. Logic may be associated with the location formulas that specify when the action is to be performed (i.e. a user is within a predefined location, outside of the predetermined location, another user is within a specified location, a data source is published at a location close to the user, and the like). The actions triggered may be many different types of events. For example, when a user moves within or out of a predetermined location, a communication with one or more other users may automatically be triggered (e.g. sending an email, a text, posting a message to a network). The triggered actions may also relate to saving data, accessing a published data source that is at the location, accessing another user's spreadsheet that is within a predetermined distance, or performing other operations that may be defined by business logic contained in formulas. These actions may also be conditionally performed based on further spreadsheet logic. The location based formulas may also be combined with any of the other spreadsheet formulas using the formula syntax and behavior that is associated with the other spreadsheet formulas.

[0029] The detect data sources formulas are configured to determine when a data source that may be utilized by the location aware spreadsheet application is available. For example, a user may enter a room for a meeting in which another user of the meeting has published a data source that may be relevant to the meeting. A user may attend a sporting event that publishes a data source relating to game statistics. A user may attend a

conference in which the conference has published one or more data sources. These data sources may be published over a network that is available to the user.

[0030] The surface data sources functions may surface other data sources that are based on the location of the user and other users. For example, users may collaborate with and use values that are stored in another user's spreadsheet that is nearby (i.e. one spreadsheet user may use data within another spreadsheet user's spreadsheet).

[0031] The location filtering functions may automatically filter data based on the location of a user. Based on location information certain values/rows/columns within the spreadsheet may be shown or not shown. For example, a spreadsheet may be used by a salesman that travels to different clients that are located in Washington, Oregon and California. When the salesman is in Washington visiting a client, the filtering function may automatically filter the spreadsheet to only show the data relevant to Washington. The filtering may be set to filter based on different granularity levels. For example, the filtering may be per company, per building, per city, state, county, country and the like. The granularity level that is displayed may be user defined and/or automatically generated. For example, a smallest granularity level may be automatically selected and/or a portion of available granularity levels may be used.

[0032] According to an embodiment, the spreadsheet itself does not need to be created in a location aware manner. For example, the column/rows that may represent location do not need to be specifically enabled to be a "location" column. Instead, the spreadsheet application 242 accesses a spreadsheet, such as spreadsheet 248, and searches for identifiers that may be associated with location values (e.g. strings that represent city, state, region, person, and the like) and automatically enables these rows/columns to be filtered based on the location information. When the location manager determines that a string or other data type (e.g. longitude/latitude) within the spreadsheet relates to a location, this value/row/column may be automatically/manually filtered/sorted using the location information. The spreadsheet may also be specifically enabled for location information. For example, when a user creates a new value, the user may specify that the value is location enabled. A value/row/column may be specified as a location type (e.g. GPS type).

[0033] As discussed, the location aware spreadsheet may also detect other spreadsheet users near the computing device. The user may collaborate with the spreadsheet users that are within the predetermined location. A location may be determined for each person or a portion of the people. For example, when a person is known to be a significant distance

that is outside of the predetermined area, that person may not be tracked for a period of time.

[0034] FIGURE 3 shows an example spreadsheet 300 with location filtering on. As illustrated, spreadsheet 300 shows different state information for Washington, Oregon and California. As discussed above, a spreadsheet may automatically filter data based on location information. For example, when a user is located in Washington, the Washington information may be displayed (310) in spreadsheet 300 without showing the other state information. As the user's location changes, the spreadsheet may be automatically refiltered and the view automatically updated. For example, when the user moves locations from Washington to Oregon, the Oregon information may be displayed (310) without showing the other state information.

[0035] The filtering may relate to people, places, and/or other physical objects. For example, a spreadsheet may have a user column that includes a list of spreadsheet users. When the user is located within a predetermined proximity to other users within the list, the spreadsheet may be filtered to display the users within the proximity. The spreadsheet filtering may be performed at any level of granularity. For example, the filtering may be specified on a specific distance, a specific building, region, city, state, and the like.

[0036] The spreadsheet may also be automatically sorted based on location information. For example, the closest people to a user may be displayed first with the farthest people being displayed at the end of the list. Similarly, as the user moves through the different states, the closest states may be displayed first within the spreadsheet followed by the next closest and so on. A combination of filtering and sorting may also be defined.

[0037] FIGURE 4 shows an example spreadsheet 400 with a location filtering user interface. As illustrated, spreadsheet 400 state information for Washington, Oregon, California and Arizona. Spreadsheet 400 also shows exemplary user interfaces that may be used for setting location based options, such as filter User Interface (UI) 410, filter menu 412 and menu 414. Many different type of UIs may be used to interact with various options. For example, the UI may be a context menu, a menu within a menu bar, a menu item selected from a ribbon user interface, a graphical menu, and the like. As illustrated, filter UI 410 is a user interface that is displayed above the columns that are contained within spreadsheet 400. Filter UI 410 may be displayed across all of the columns, a portion of the columns, or above one or more columns (e.g. filter menu 412). When a filter menu is selected various filtering options are available to be selected. For example,

the filtering options may be presented in a menu, such as menu 414. The filtering options may comprise a variety of options, such as filter to a location (e.g. current or selected location), filter by proximity (e.g. show within a predefined area), sort by distance and other options. For example, the other options may include options to set preferences such as distances used in filtering, level of detail presented, how often to obtain location information, and the like. A context menu may also be used to receive the filtering options. For example, a user may right click on a cell at which point a context menu may be displayed. The context menu may be similar to menu 414. The user may then select the filtering option.

[0038] FIGURE 5 shows an illustrative process 500 for integrating location information into spreadsheets. When reading the discussion of the routines presented herein, it should be appreciated that the logical operations of various embodiments are implemented (1) as a sequence of computer implemented acts or program modules running on a computing system and/or (2) as interconnected machine logic circuits or circuit modules within the computing system. The implementation is a matter of choice dependent on the performance requirements of the computing system implementing the invention. Accordingly, the logical operations illustrated and making up the embodiments described herein are referred to variously as operations, structural devices, acts or modules. These operations, structural devices, acts and modules may be implemented in software, in firmware, in special purpose digital logic, and any combination thereof.

[0039] After a start block, the process moves to operation 510, where location information is obtained. The location information may relate to the location of the user and to location of other users. For example, the location for the user may be obtained and the location for one or more other users may also be obtained. The location information may be obtained from a user, provided by sensors on the device and/or from some other location. For example, a location service may provide location information for the user and for the other users. The location information may provide varying levels of accuracy (e.g. a GPS may be very accurate, whereas an IP address may only be a rough estimate). The location information may also be obtained from a user. For example, a user may input their location information using a user interface.

[0040] Moving to block 520, the location information is used by the spreadsheet. The location information may be used to filter/sort the spreadsheet based on the location of the user and/or other user(s). Formulas within the spreadsheet may use the location information to perform or trigger some other operation. The location information may

also be used to locate published data sources within the area. Other users within a specified vicinity of the user may also be located. Some of the formulas using the location information may specify that the obtained location information be converted to another location format. For example, GPS coordinates may be converted to a name of a location, a block, a city, and the like.

[0041] Transitioning to operation 530, the operations triggered by the location information are performed. For example, sending a message, starting a collaboration, filtering, surfacing a data source, changing a view of the spreadsheet, and the like.

[0042] Flowing to operation 540, the spreadsheet is displayed. As discussed, the display of the spreadsheet may be automatically modified based on a location of the user and/or other users. For example, as a user moves location the data that is displayed to the user within the spreadsheet may change.

[0043] The process then flows to an end block and returns to processing other actions.

[0044] The above specification, examples and data provide a complete description of the manufacture and use of the composition of the invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.

WHAT IS CLAIMED IS:

1. A method for using location information with a spreadsheet, comprising:

receiving location information;

performing an operation on data within the spreadsheet using the location information that creates updated information; wherein the spreadsheet application interacting with the spreadsheet comprises native location based functionality; and

displaying the spreadsheet with the updated information.

2. The method of Claim 1, further comprising determining a location of other spreadsheet users and when a data source is near the user.

3. The method of Claim 1, wherein displaying the spreadsheet comprises at least one of: automatically filtering the display of the spreadsheet based on the location information and automatically sorting the display of information that is associated with the spreadsheet based on the location information.

4. The method of Claim 1, further comprising accessing the spreadsheet and examining the spreadsheet to determine at least one of: a row and a column that are associated with a location and a spreadsheet object that is associated with a location and wherein a different portion of the spreadsheet is automatically displayed as a result of the location information changing.

5. The method of Claim 1, wherein the native location based formulas comprise at least two of: a formula to convert location data to different forms of location data, a formula to determine a location of a current user, a formula to determine locations of other users, a formulas to trigger actions within the spreadsheet based on the location data, a formula to detect data sources in a predetermined proximity to the spreadsheet and a formula to filter data within the spreadsheet based on the location data.

6. The method of Claim 1, further comprising determining when another user is within a predetermined proximity, determining when the user has data that is available for collaborating and beginning a collaboration session when the user is within the predetermined proximity.

7. A computer-readable storage medium storing computer-executable instructions for integrating location information with a spreadsheet, comprising:

receiving location information;

determining a location of other spreadsheet users;

performing an operation on data within the spreadsheet using the location information; wherein a spreadsheet application interacting with the spreadsheet comprises native location based functions;

displaying the spreadsheet;

determining when a data source is near the user and surfacing the data source in a display; and

changing a display of the spreadsheet in response to a predetermined change in the location information.

8. A system for integrating location information with a spreadsheet, comprising:

a network connection that is configured to connect to a network;

a processor, memory, and a computer-readable storage medium;

a display;

an operating environment stored on the computer-readable storage medium and executing on the processor; and

a location manager operating under the control of the operating environment and operative to:

receive location information;

perform an operation on data within the spreadsheet using the location information; wherein the spreadsheet comprises native location based functions;

display the spreadsheet; and

change a display of the spreadsheet in response to a predetermined change in the location information.

9. The system of Claim 8, further comprising determining when a data source is near the user and surfacing the data source in a display.

10. The system of Claim 8, wherein displaying the spreadsheet comprises automatically filtering the display of the spreadsheet based on the location information.

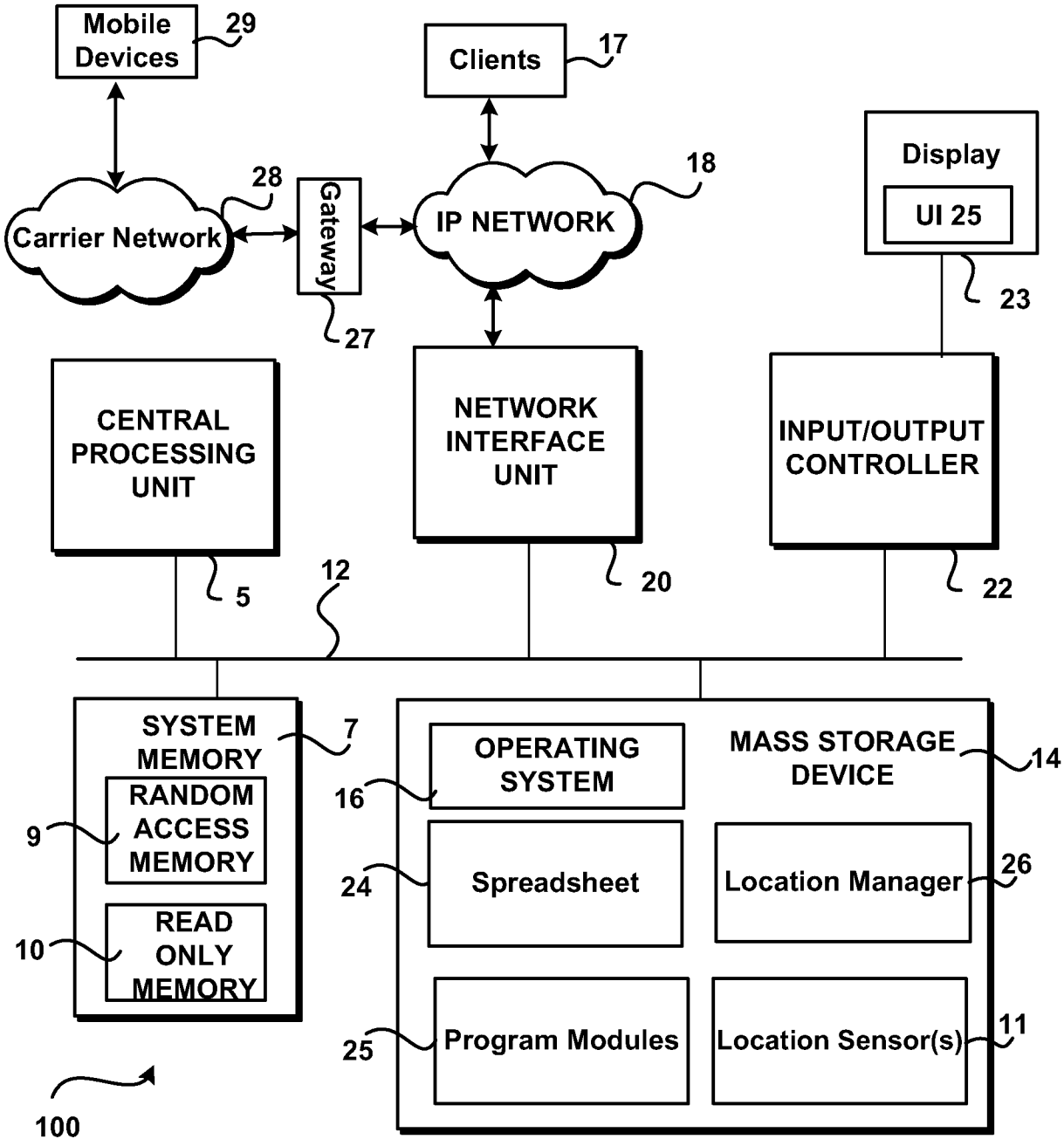
Mobile Devices
29
Clients
17
Display
UI 25
23
18
28
Carrier Network
Gateway
IP NETWORK
27
CENTRAL PROCESSING UNIT
NETWORK INTERFACE UNIT
INPUT/OUTPUT CONTROLLER
5
12
20
22
SYSTEM MEMORY
7
RANDOM ACCESS MEMORY
9
READ ONLY MEMORY
10
OPERATING SYSTEM
16
MASS STORAGE DEVICE
14
Spreadsheet
24
Location Manager
26
Program Modules
25
Location Sensor(s)
11
100

FIG.1

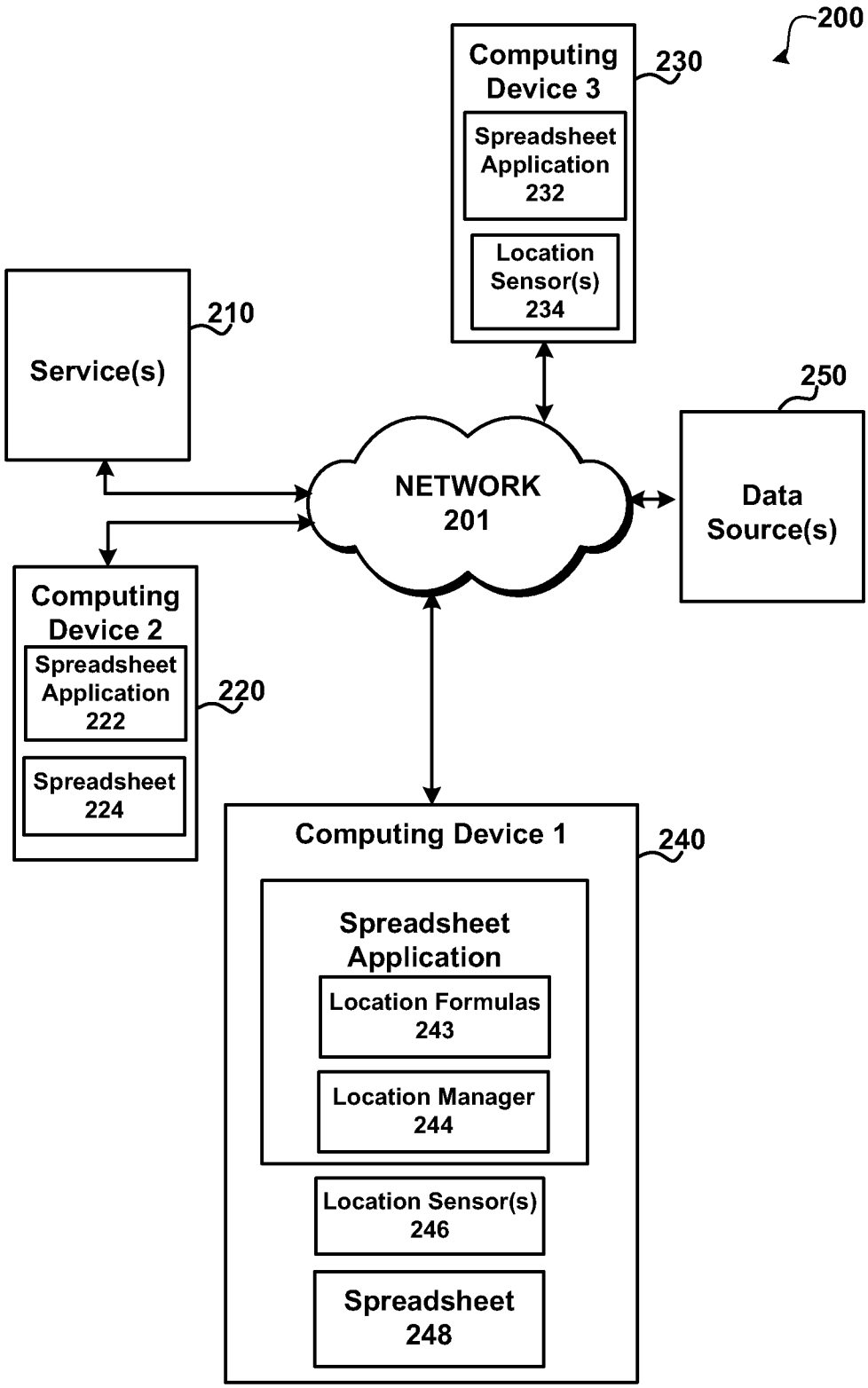
200
Computing Device 3
230
Spreadsheet Application 232
Location Sensor(s) 234
Service(s)
210
250
NETWORK 201
Data Source(s)
Computing Device 2
Spreadsheet Application 222
220
Spreadsheet 224
Computing Device 1
240
Spreadsheet Application
Location Formulas 243
Location Manager 244
Location Sensor(s) 246
Spreadsheet 248

FIG.2

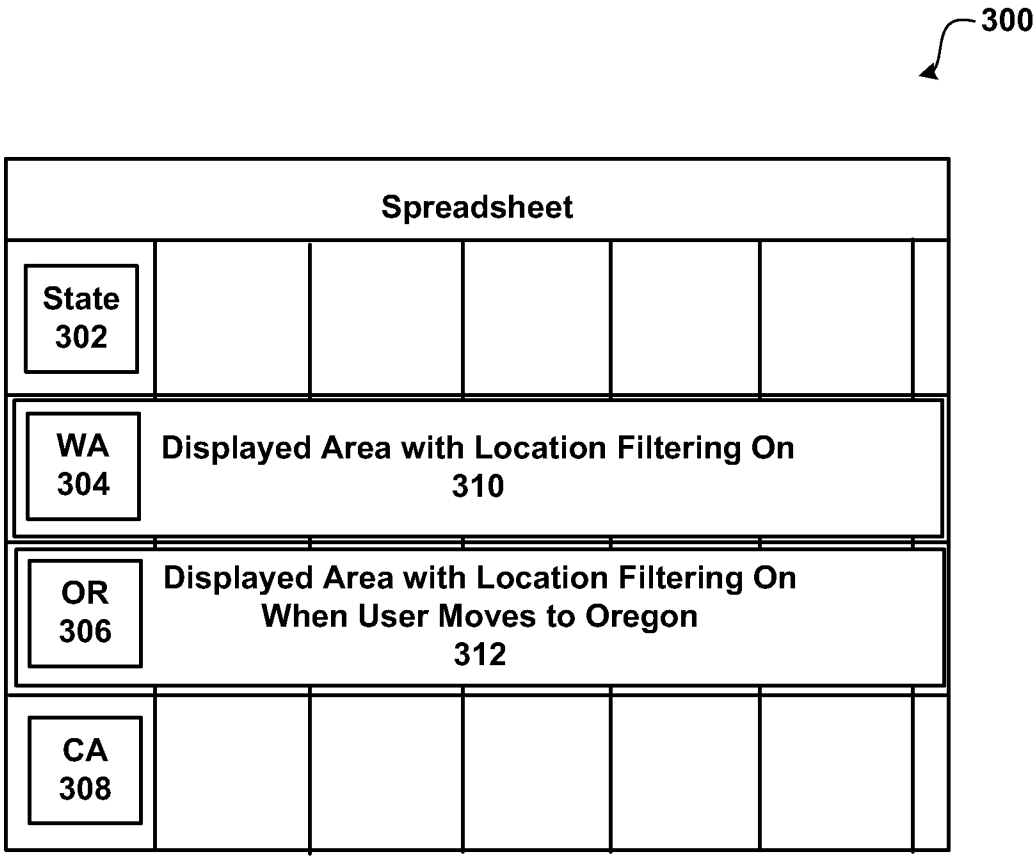
300
Spreadsheet
State
302
WA
304
Displayed Area with Location Filtering On
310
OR
306
Displayed Area with Location Filtering On
When User Moves to Oregon
312
CA
308

FIG.3

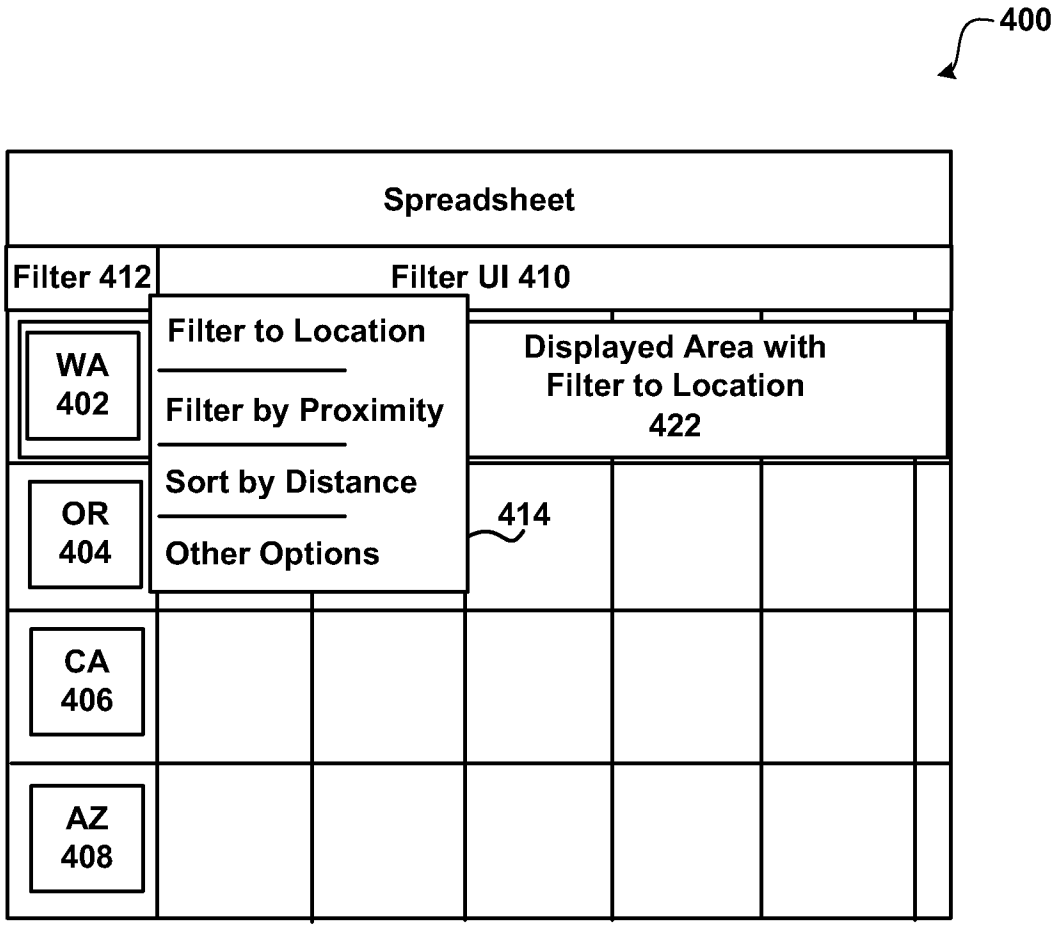
400
Spreadsheet
Filter 412
Filter UI 410
Filter to Location
Filter by Proximity
Sort by Distance
Other Options
414
WA
402
OR
404
CA
406
AZ
408
Displayed Area with
Filter to Location
422

FIG.4

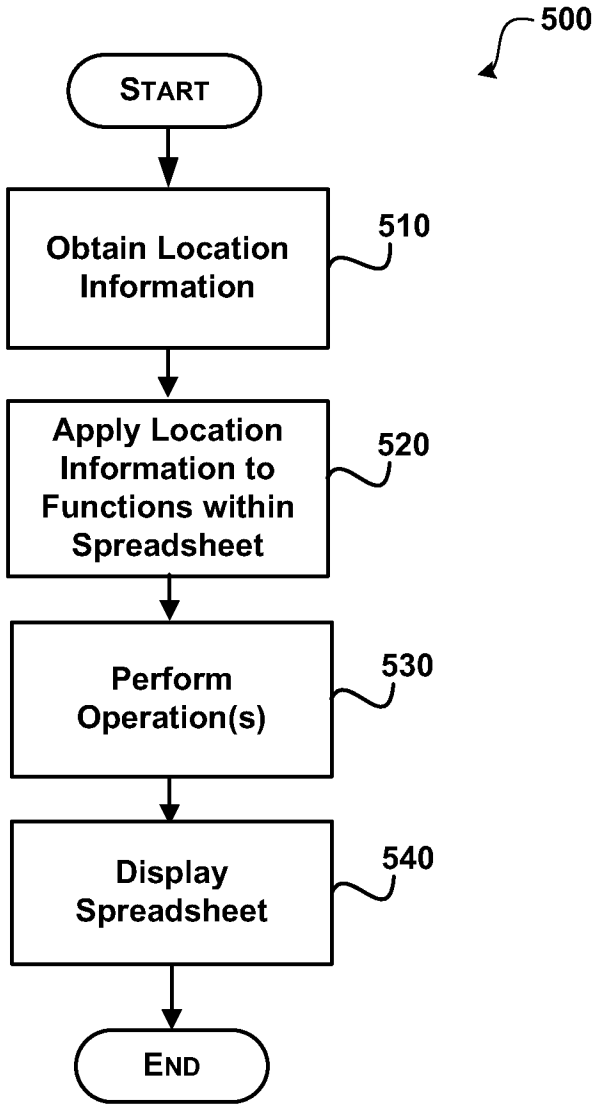
500
START
Obtain Location Information
510
Apply Location Information to Functions within Spreadsheet
520
Perform Operation(s)
530
Display Spreadsheet
540
END

FIG. 5