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(54) RENDERING DATA USING RENDERING INSTRUCTIONS BASED UPON CONCEPT IDENTIFIERS FOR THE DATA

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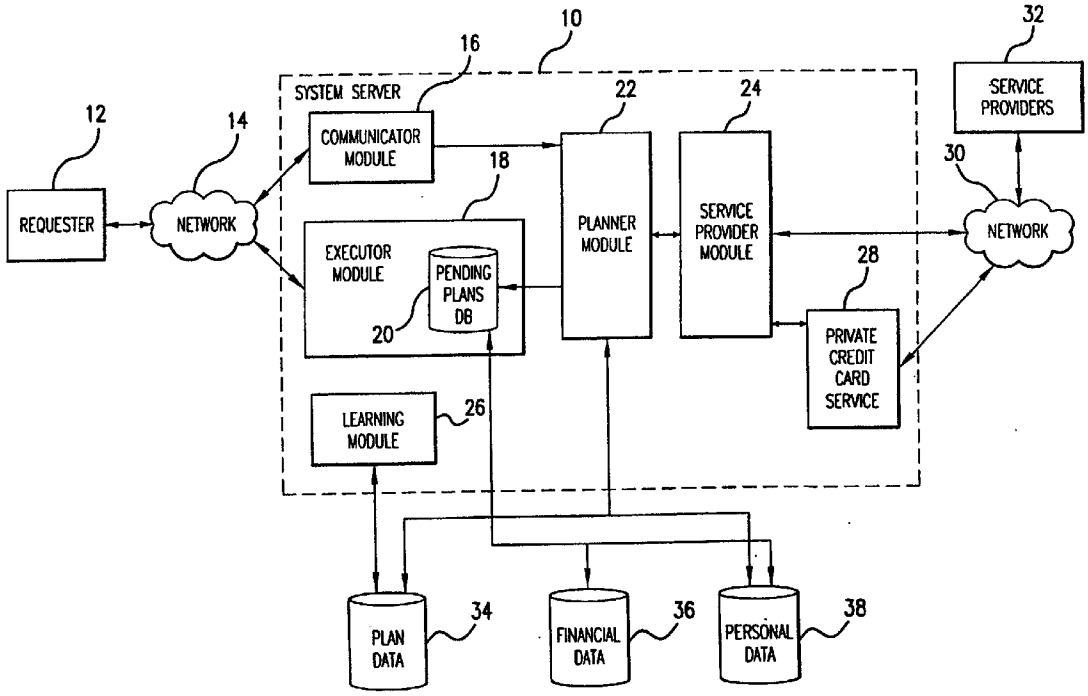
(57) ABSTRACT

Rendering of data on user devices using rendering instructions and interaction rules. The data includes concepts representing data elements and having associated concept identifiers. Using the concept identifiers, a system retrieves rendering instructions for the corresponding data element in order to present the data element on a display of a user device. For interactive elements that can be selected by a user, the system retrieves interaction rules in order to determine how to render data for the interactive element based upon the user's selection of it.



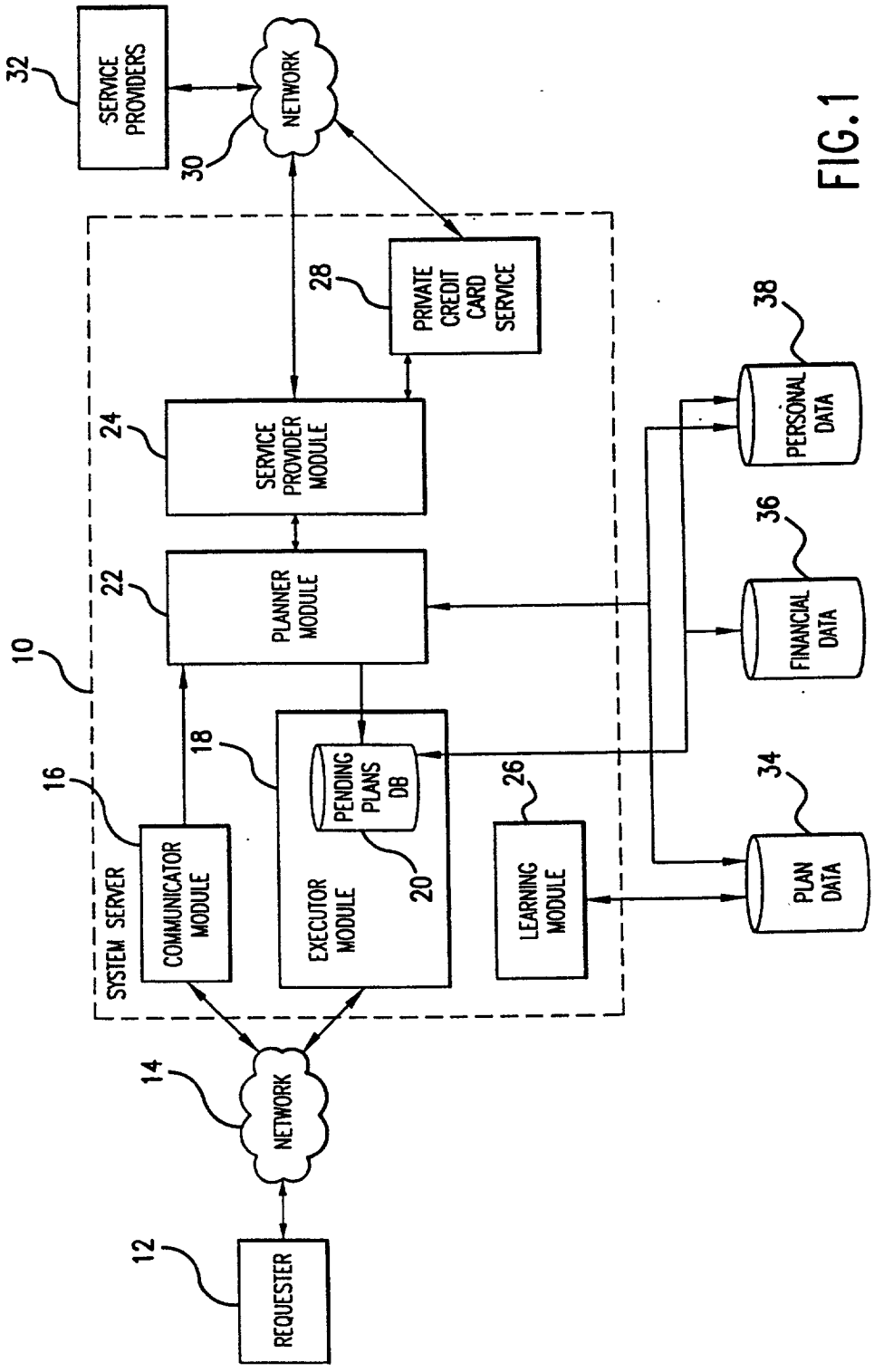

SERVICE PROVIDERS
32
NETWORK
30
PRIVATE CREDIT CARD SERVICE
28
SERVICE PROVIDER MODULE
24
PLANNER MODULE
22
10
SYSTEM SERVER
COMMUNICATOR MODULE
16
EXECUTOR MODULE
18
PENDING PLANS DB
20
LEARNING MODULE
26
PERSONAL DATA
38
FINANCIAL DATA
36
PLAN DATA
34
NETWORK
14
REQUESTER
12

FIG. 1

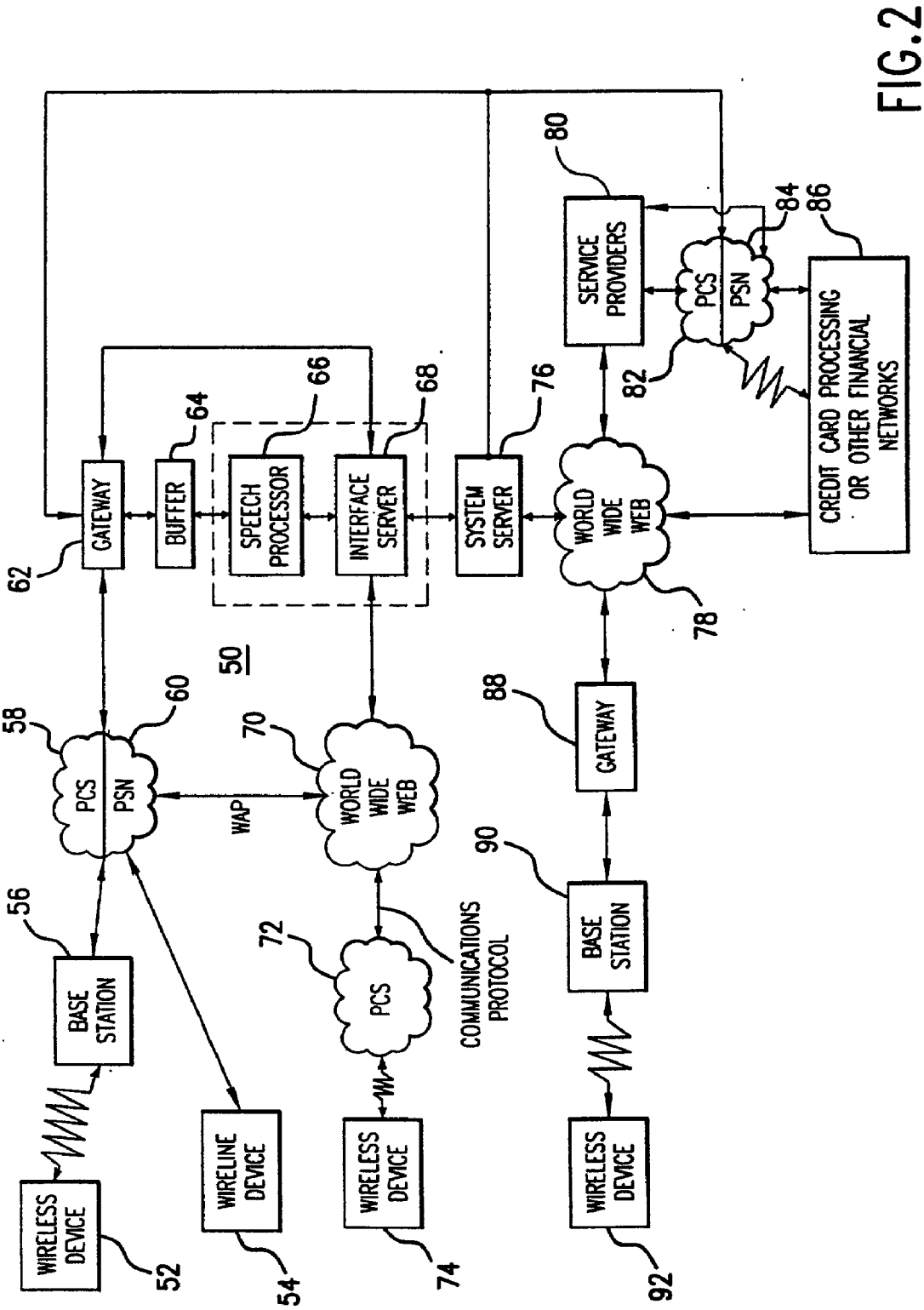

WIRELESS DEVICE
52
BASE STATION
56
PCS PSN
58
60
WIRELINE DEVICE
54
WAP
WORLD WIDE WEB
70
PCS
72
WIRELESS DEVICE
74
COMMUNICATIONS PROTOCOL
50
62
GATEWAY
BUFFER
64
SPEECH PROCESSOR
66
INTERFACE SERVER
68
SYSTEM SERVER
76
WORLD WIDE WEB
78
SERVICE PROVIDERS
80
82
PCS PSN
84
CREDIT CARD PROCESSING OR OTHER FINANCIAL NETWORKS
86
GATEWAY
88
BASE STATION
90
WIRELESS DEVICE
92

FIG. 2

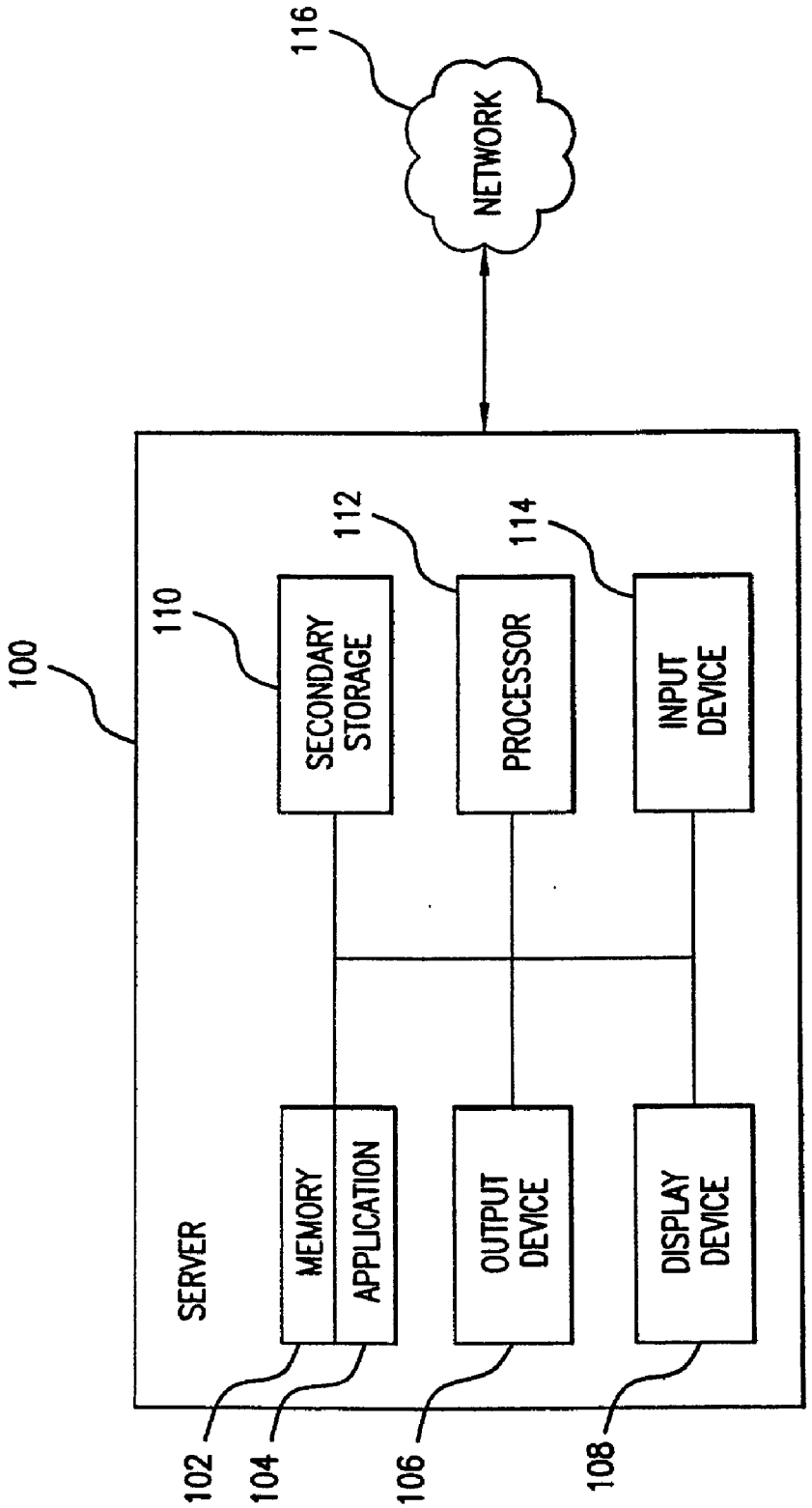

116
NETWORK
100
110
SECONDARY STORAGE
112
PROCESSOR
114
INPUT DEVICE
SERVER
MEMORY
APPLICATION
OUTPUT DEVICE
DISPLAY DEVICE
102
104
106
108

FIG.3

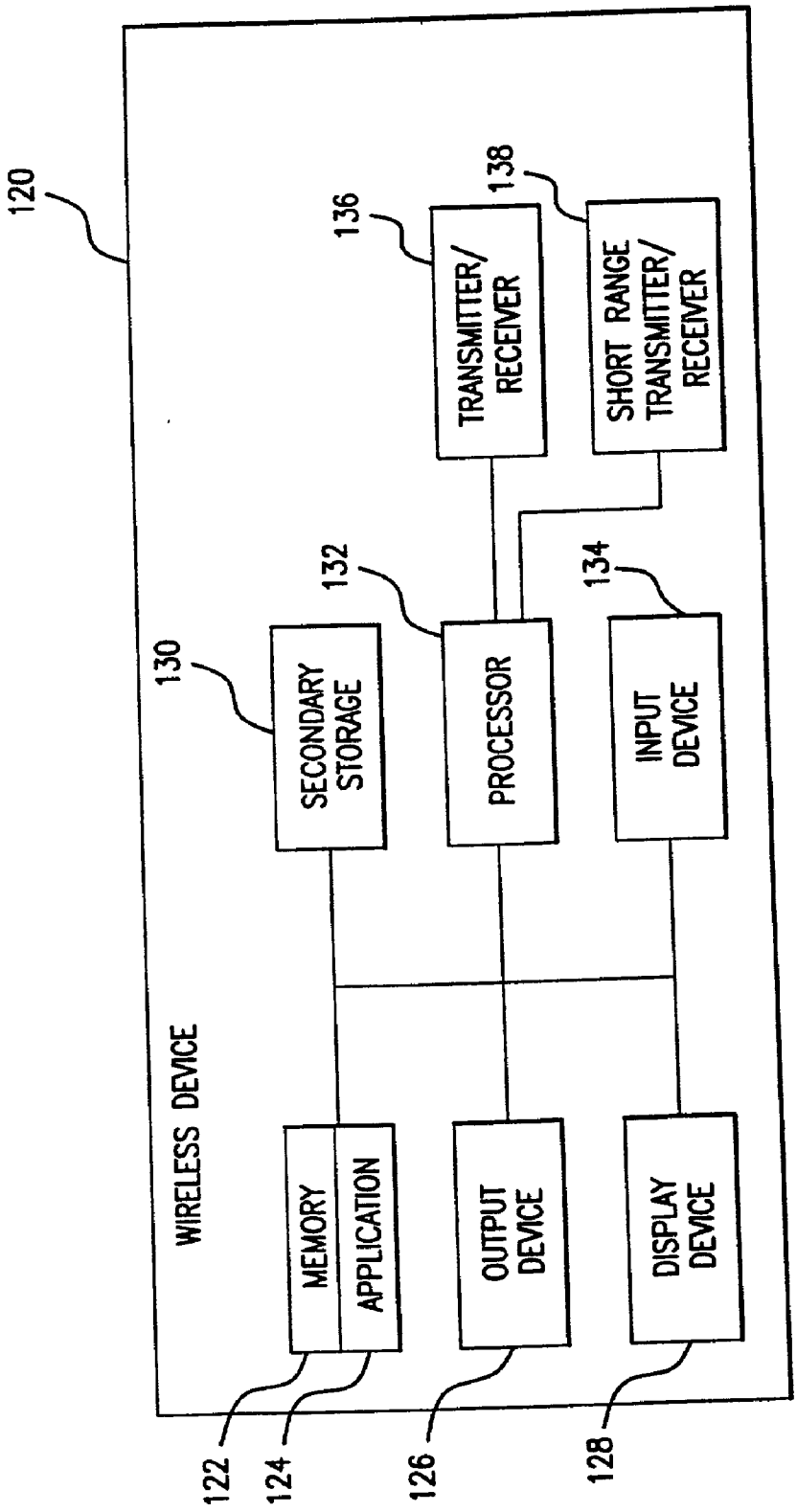

120
WIRELESS DEVICE
136
TRANSMITTER/ RECEIVER
138
SHORT RANGE TRANSMITTER/ RECEIVER
132
PROCESSOR
134
INPUT DEVICE
130
SECONDARY STORAGE
MEMORY
APPLICATION
OUTPUT DEVICE
DISPLAY DEVICE
122
124
126
128

FIG.4

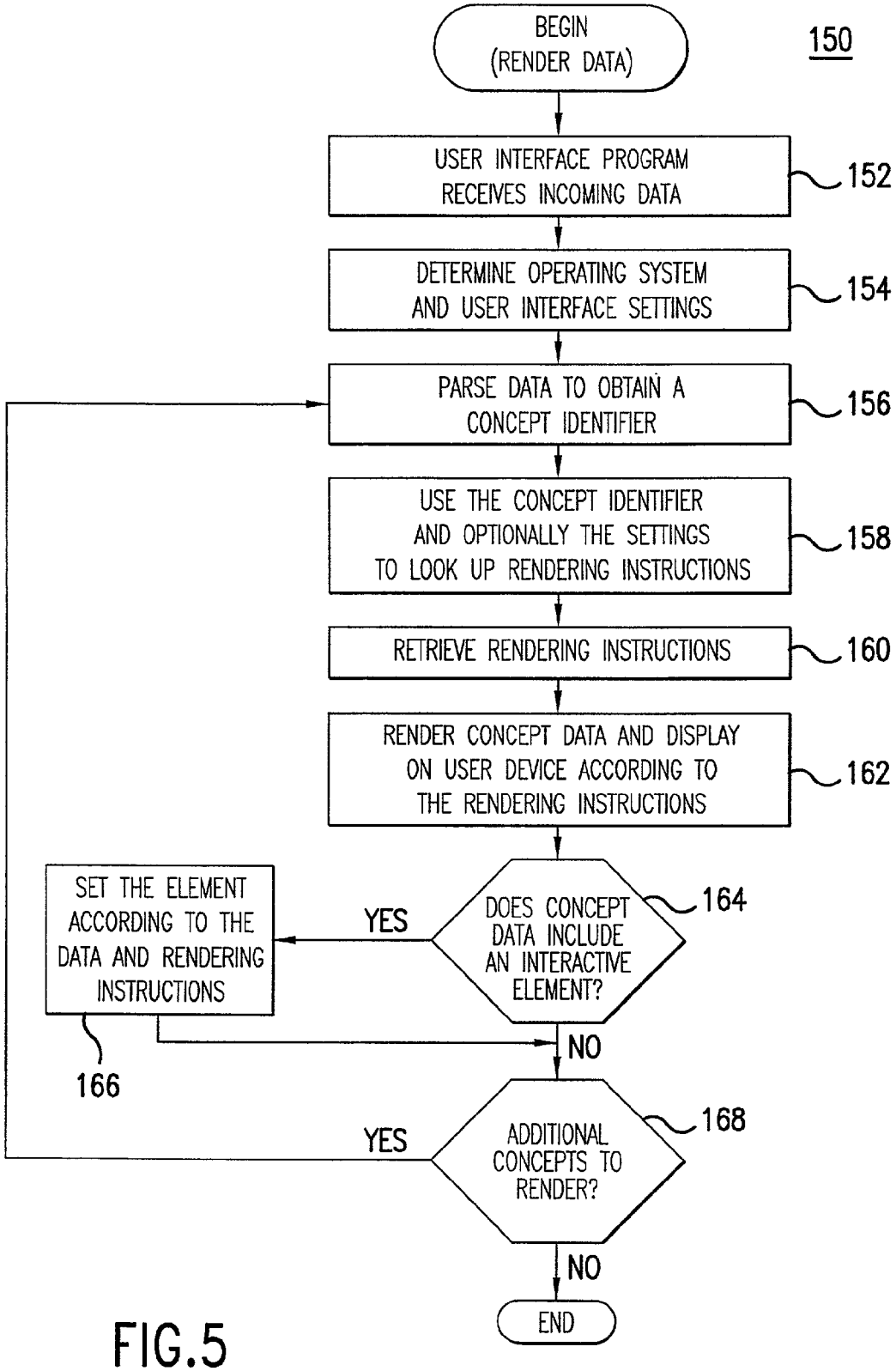

BEGIN
(RENDER DATA)
150
USER INTERFACE PROGRAM RECEIVES INCOMING DATA
152
DETERMINE OPERATING SYSTEM AND USER INTERFACE SETTINGS
154
PARSE DATA TO OBTAIN A CONCEPT IDENTIFIER
156
USE THE CONCEPT IDENTIFIER AND OPTIONALLY THE SETTINGS TO LOOK UP RENDERING INSTRUCTIONS
158
RETRIEVE RENDERING INSTRUCTIONS
160
RENDER CONCEPT DATA AND DISPLAY ON USER DEVICE ACCORDING TO THE RENDERING INSTRUCTIONS
162
DOES CONCEPT DATA INCLUDE AN INTERACTIVE ELEMENT?
164
YES
SET THE ELEMENT ACCORDING TO THE DATA AND RENDERING INSTRUCTIONS
166
NO
ADDITIONAL CONCEPTS TO RENDER?
168
YES
NO
END

FIG.5

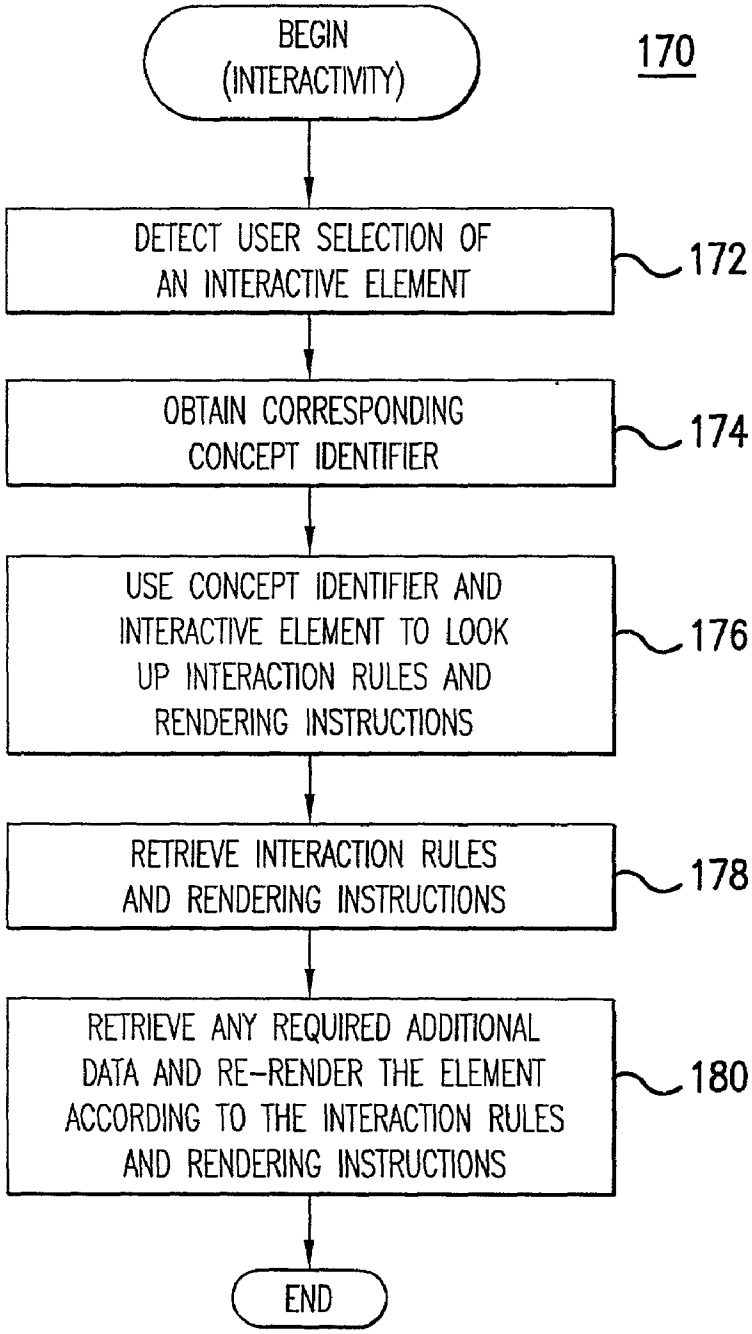

BEGIN
(INTERACTIVITY)
170
DETECT USER SELECTION OF AN INTERACTIVE ELEMENT
172
OBTAIN CORRESPONDING CONCEPT IDENTIFIER
174
USE CONCEPT IDENTIFIER AND INTERACTIVE ELEMENT TO LOOK UP INTERACTION RULES AND RENDERING INSTRUCTIONS
176
RETRIEVE INTERACTION RULES AND RENDERING INSTRUCTIONS
178
RETRIEVE ANY REQUIRED ADDITIONAL DATA AND RE-RENDER THE ELEMENT ACCORDING TO THE INTERACTION RULES AND RENDERING INSTRUCTIONS
180
END

FIG.6

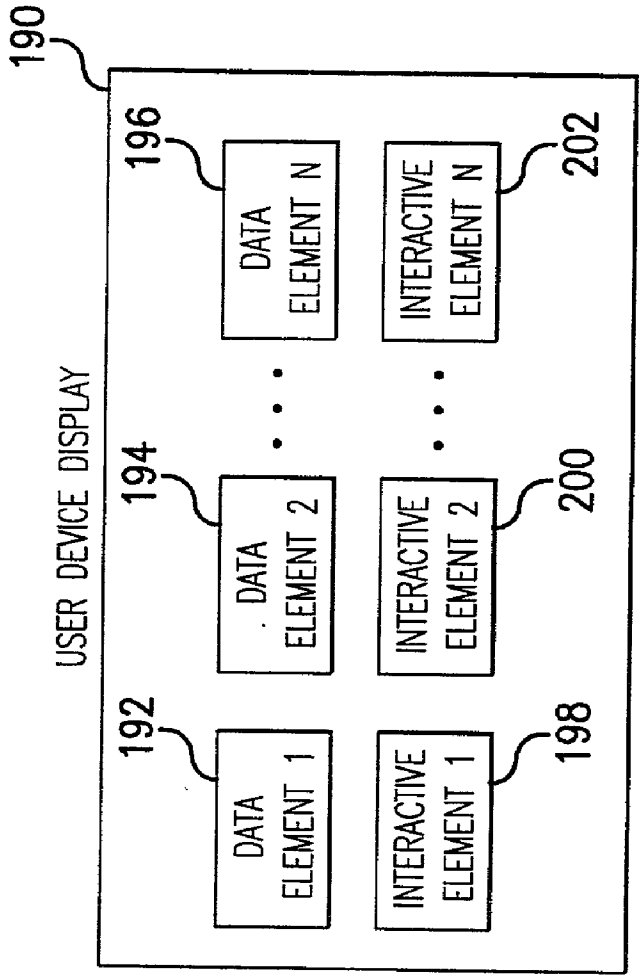

190
USER DEVICE DISPLAY
192
DATA ELEMENT 1
194
DATA ELEMENT 2
196
DATA ELEMENT N
198
INTERACTIVE ELEMENT 1
200
INTERACTIVE ELEMENT 2
202
INTERACTIVE ELEMENT N

FIG.7

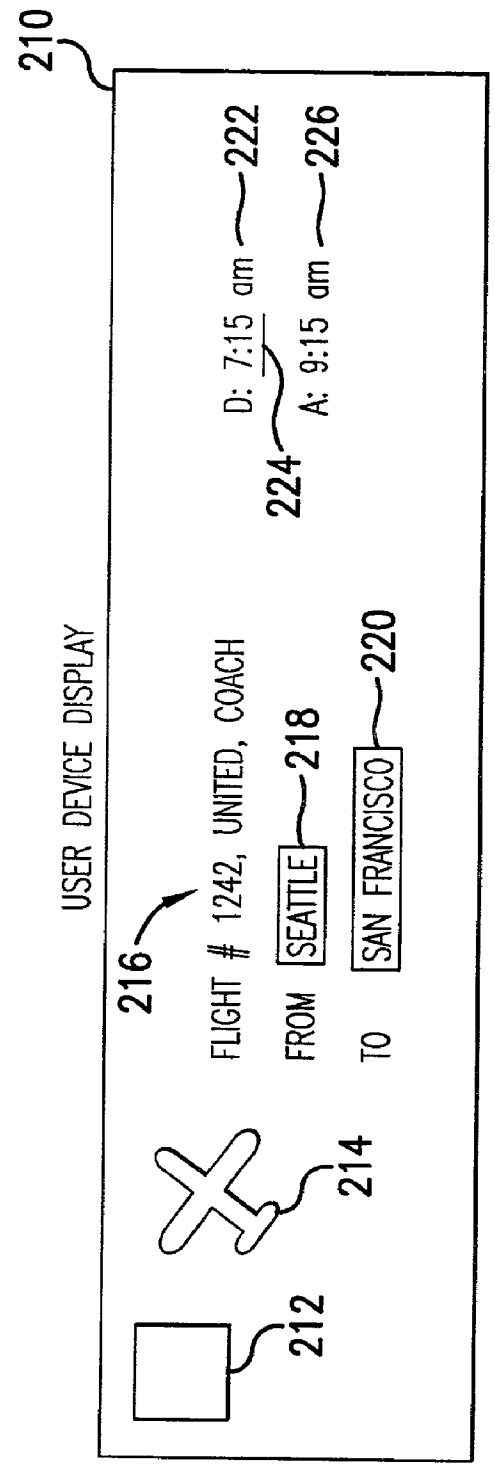

210
USER DEVICE DISPLAY
216
FLIGHT # 1242, UNITED, COACH
FROM SEATTLE
TO SAN FRANCISCO
D: 7:15 am
A: 9:15 am
212
214
218
220
222
224
226

FIG.8

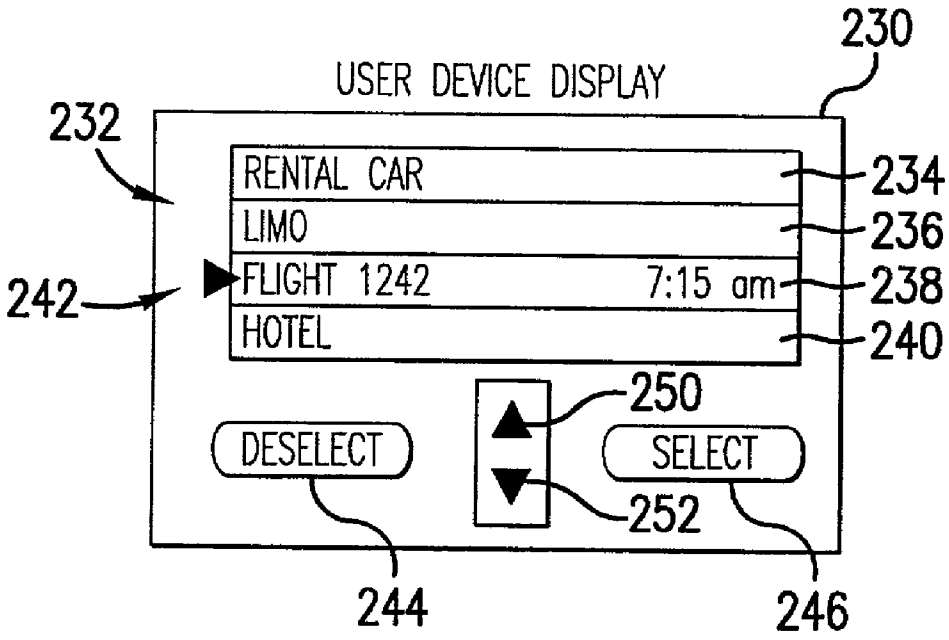

230
USER DEVICE DISPLAY
232
RENTAL CAR
LIMO
FLIGHT 1242 7:15 am
HOTEL
234
236
238
240
242
250
252
DESELECT
SELECT
244
246

FIG.9

RENDERING DATA USING RENDERING INSTRUCTIONS BASED UPON CONCEPT IDENTIFIERS FOR THE DATA

REFERENCE TO RELATED APPLICATIONS

[0001] The present application is related to the following applications, all of which are incorporated herein by reference as if fully set forth: Brian C. Roundtree U.S. provisional patent application Ser. No. 60/182,330, entitled "Web-Based Personal Assistance Communication Method," and filed Feb. 14, 2000; United States patent application of Brian C. Roundtree, entitled "Web-Based Personal Assistance Communication System," and filed Jul. 17, 2000; United States patent application of Brian C. Roundtree, entitled "Web-Based Personal Assistance Communication Method," and filed Jul. 17, 2000; United States patent application of Brian C. Roundtree, entitled "Web-Based Personal Assistance User Interface System," and filed Jul. 17, 2000; United States patent application of Brian C. Roundtree, entitled "Voice-to-Concept Conversion System," and filed on Sep. 8, 2000; United States patent application of Craig G. Eisler and Brian C. Roundtree, entitled "On-Line Service Provider Sign-Up System," and filed on Sep. 8, 2000; United States patent application of Keldon V. Rush and Brian C. Roundtree, entitled "System for Converting Textual Concepts to Interactive Audio and Audio/Visual Presentations," and filed on Sep. 8, 2000; United States patent application of Brian C. Roundtree, entitled "System for Obtaining Service-Related Information for Local Interactive Wireless Devices," and filed on Sep. 8, 2000; United States patent application of Cristiano L S Pierry and Brian C. Roundtree, entitled "System for Secure Electronic Transactions Using Unique Identifiers for Order-Related Information," and filed on Sep. 8, 2000; United States patent application of Brian C. Roundtree, entitled "Airline Flight Departure and Arrival Prediction Based Upon Historical and Real-Time Data," and filed on same date herewith; United States patent application of Craig G. Eisler and Brian C. Roundtree, entitled "Hypertext Concept Notation for Dynamically Constructing a Sentence to Respond to a User Request," and filed on same date herewith; United States patent application of Craig G. Eisler and Brian C. Roundtree, entitled "Assembling Personal Information of a Target Person Based Upon Third-Party Information and a Request Purpose," and filed on same date herewith; United States patent application of Brian C. Roundtree, entitled "Automated Reservation and Appointment System Using Interactive Voice Recognition," and filed on same date herewith; and United States patent application of Cristiano L S Pierry and Brian C. Roundtree, entitled "Automated Alert State Change of User Devices for Time-Based and Location-Based Events," and filed on same date herewith.

FIELD OF THE INVENTION

[0002] The present invention relates to an apparatus and method for rendering data using rendering instructions for data elements and interaction instructions for interactive elements.

BACKGROUND OF THE INVENTION

[0003] Wireless devices, such as cell phones and personal digital assistants (PDAs), are becoming more commonly used and have the potential for communication over the Internet in addition to traditional telephone networks. The Internet communication with these devices permits users to obtain services and other related information using wireless communication with the devices. For example, a user can download content from the world wide web on the Internet using a cell phone and have the information displayed on the display panel of the cell phone. Therefore, in addition to using the cell phone for voice communication, the user can obtain content over the Internet concerning, for example, services available from service providers. The user can also execute transactions over the Internet using the cell phone or other wireless device. For example, the user can make electronic purchases for good or services, analogous to how users can make transactions over the Internet using a personal computer having a connection to the Internet.

[0004] Many wireless devices, however, provide for limited ways to enter information for communications over the Internet. Cell phones, for example, typically have only a key pad in addition to a microphone, making entry of textual information slow and inconvenient. Other devices, such as PDAs, may have even more limited ways to enter textual information. Therefore, these devices do not typically provide the same ease of interacting over the Internet as provided by a personal computer having a keyboard and cursor-control device for easy and convenient "point and click" selection of content displayed in web pages. These devices may also be limited in how information can be displayed. Wireline devices, such as conventional phones, provide for even more limited interaction over the Internet.

[0005] Also, when using these user devices to execute the transactions, the information available through the transactions is often limited. A user request for content often results in generic content potentially applicable to many situations other than the particular situation of the user. For example, a user may want information about purchasing gifts for others or information about services available such as travel-related information. In response to a request for such information, the user may be provided with information about gifts for generic categories and other information for general travel-related services. Without targeting the information to the user's situation, the information may not have much value to the user.

[0006] Accordingly, a need exists for increased options and versatility for user's having wireless devices or wireline devices to interact and make transactions over the Internet, for increased versatility to request service or make transactions with service providers, and for obtaining more information targeted to a user's particular situation or request.

SUMMARY OF THE INVENTION

[0007] A method and apparatus consistent with the present invention render data on a user device based upon concepts. The user device receives incoming data including concept identifiers for use in identifying concepts relating to the data. Rendering instructions are received based upon the concept identifiers, and the data is rendered on the user device based upon the rendering instructions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings are incorporated in and constitute a part of this specification and, together with the description, explain the advantages and principles of the invention. In the drawings,

[0009] **FIG. 1** is a diagram of a system for processing requests for service;

[0010] **FIG. 2** is a diagram of a network for communicating with wireless and wireline devices and service providers to process requests for service;

[0011] **FIG. 3** is a diagram of exemplary components of a server for processing requests for service;

[0012] **FIG. 4** is a diagram of exemplary components of a wireless device;

[0013] **FIG. 5** is a flow chart of a method for rendering data on a user device;

[0014] **FIG. 6** is a flow chart of a method for re-rendering interactive elements based upon a user's selection of them;

[0015] **FIG. 7** is a diagram illustrating rendering of a data elements and interactive elements on a user device;

[0016] **FIG. 8** is a diagram illustrating an example of rendering data including interactive elements; and

[0017] **FIG. 9** is a diagram illustrating another example of rendering data including interactive elements.

DETAILED DESCRIPTION

Introduction

[0018] Embodiments consistent with the present invention provide various features for a web-based electronic personal assistant, as described in the web-based personal assistance applications identified above. The electronic personal assistant is implemented with a system server that the receives requests from users through wireless or wireline devices and processes the requests in order to provide the user with requested service or information. These features permit the user to interact with the system server in a variety of ways such as through a display on the device, a keyboard or keypad, or through voice interaction. The system server can present information to the user in a variety of ways as well, such as through audio communication or through information presented on a display with, for example, textual information, screens, or web pages presented with HyperText Markup Language (HTML).

[0019] The requests, as explained in the web-based personal assistance applications identified above, can include any request for service or information. For example, a user may request a meeting, and in response the system server queries the user to obtain information required to arrange the meeting and then automatically makes the arrangements. As another example, a user may request information concerning services in a particular geographic location or based upon other parameters, and the system server can query the user to determine the type of information requested, such as particular types of retail establishments, and provide the information to the user. As another example, a user may request to purchase goods or services, or make reservations for services, and in response the system server queries the user to determine the type of goods or services desired as well as other information such as a desired price. Based upon that information, the system server automatically makes the purchase for the user. For the reservations example, the system server can query the user to determine information required to make the reservations for the user. For any request, the system server can access user preferences to obtain information required or useful to process the request, such as the user's credit card information and shipping address.

[0020] In addition, the system server can automatically notify the user of particular information. The system server typically maintains a database of preferences for the users in order to help process the requests. It also maintains a concept database and uses the concepts in order to retrieve and construct queries, such as text fragments, for the user. The use of only text fragments, for example, saves transmission time in comparison to transmission of graphical information over a network; alternatively, graphics can be used in addition to the text fragments.

[0021] Based upon the type of request, and potentially user preferences, the system server selects the appropriate queries from the concept database to obtain information to process the request. Upon completion of the processing, the system server can present to the user a sentence constructed from the related concepts in order to confirm the request. It can also use the sentence to document the request, retrieve the appropriate resources for it, and otherwise fulfill the request. This process, and the use of these concepts and the structure for a concept database, are further described in the web-based personal assistance applications identified above.

[0022] The system server can also cross-reference the concept database with a service provider database. In order to fulfill requests, the system server can access a database identifying available service providers for the request. At the end of each string of concepts in the concept database, that database can specify a link or pointer to the relevant service providers in the service provider database. For example, if the request is for a meeting, once the system server has all the relevant information as constructed from the concepts, the concept for the location of the meeting can include a pointer or link to the establishments proximate the location and available to provide food for the meeting. Therefore, information for relevant service providers can be associated with the appropriate concepts in the concept database.

Request Processing

[0023] **FIG. 1** is a diagram of a system for fulfilling a request for service. The system includes a system server **10** for processing a request transmitted from a requester **12** through a network **14** such as the Internet or other wireline or wireless network. System server **10** includes several software modules for processing the request from requestor **12**. A communicator module **16** manages an interface for the communications with requestor **12** over network **14**. Communicator module **16** receives the request and provides necessary formatting and other processing for transmitting it to a planner module **22**.

[0024] Planner module **22** interacts with a service provider module **24** in order to obtain the resources for fulfilling the request. In particular, service provider module **24** interacts over a network **30**, such as the Internet or a phone network, with one or more service providers **32** in order to obtain services to fulfill the request. Service provider module **24** provides for communication and data conversion for the interaction, while planner module **22** manages processing of the request and interacts with various databases for processing the request. A private credit card service module **28** can

provide for secure order processing of the request to help safeguard users' personal information such as credit card numbers.

[0025] Once the planner module **22** has obtained the resources for the request, it communicates information to fulfill the request to an executor module **18**. Executor module **18** includes a pending plan database **20** for storing and managing resources and other information to fulfill the request. Executor module **18** thus communicates back over network **14** with requester **12** to provide confirmation of the request and also to execute the request.

[0026] A learning module **26** can provide for fine-tuning plan data within a database **34** in order to more efficiently process requests, particularly from the same requestor. Other databases include a database **36** storing financial data accessed by executor module **18**, and a database **38** storing personal data accessed by executor module **18** and planner module **22**. The personal data can include an account for each user having a profile and preferences for the users, and the information can be indexed by a particular user identifier such as a phone number or code.

[0027] Table 1 illustrates a user account. As shown, the user accounts can include users' preferences for a wide variety of information such as for travel, dining, and other types of service providers. The user preferences can be continually updated and refined over time as the system server gathers more information concerning the user, and the system server can optionally use learning models for the refinements and use the preferences to make "smart choices" in processing users' requests. The information can be stored in a variety of ways such as in a relational database or with name-value pairs in Extensible Markup Language (XML).

TABLE 1

user 1 identifier	data
contact	name, address
profile	user 1 characteristics
hotel information	user 1 hotel preferences
airline information	user 1 airline preferences
rental car information	user 1 rental car preferences
restaurant information	user 1 restaurant preferences
service provider preferences	user 1 service provider preferences
other category	user 1 preferences for the category

[0028] Processing to fulfill the request is further explained in the web-based personal assistance applications identified above.

Network

[0029] **FIG. 2** is a diagram of an exemplary network **50** illustrating interaction for receiving and processing requests from users such as requestor **12**. It illustrates how the system can receive requests through wireless and wireline transmission over conventional phone and cellular networks as well as the Internet or other computer networks. A requester typically makes a request from a wireless or wireline device. The wireless devices include any device capable of wireless electronic communication and examples include the following: cellular phones; PDAs with wireless network access; wireless Internet appliances; personal computers (including desktop, laptop, notebook, and others) with wireless network access; and personal computers with microphones, speakers, and circuitry for permitting wireless phone calls. The wireline devices include any device capable of electronic wireline communication and examples include the following: conventional phones; PDAs with wireline network access; Internet appliances; personal computers (including desktop, laptop, notebook, and others) with wireline network access; and personal computers with microphones, speakers, and circuitry for permitting wireline phone calls.

[0030] A wireless device **52**, for example, can interact through wireless transmission with a base station **56** for communication over a personal communication system (PCS) **58**. A request may also be made from a wireline device **54** communicating over a public switched telephone network (PSN) **60**. Systems for wireless and wireline communication, includes a PCS and PSN, are known in the art.

[0031] Communications through networks **58** and **60** are transmitted through a gateway **62** and potentially a buffer **64** to a speech processor **66** for performing processing of audio or particular types of communications, such as for voice-to-text conversion. Also, the communication may occur directly from gateway **62** to an interface server **68**. Interface server **68** controls gateway **62**, and it provides an interface between a system server **76** and gateway **62**, speech processor **66**, and the world wide web **70**.

[0032] System server **76** corresponds with system server **10** in **FIG. 1** to process user requests. Interface server **68** provides the data conversion and processing for transferring data to and from system server **76**. As shown by the dashed line, speech processor **66** and interface server **68** can be implemented with the same physical machine or with different machines. Also, system server **76** can be implemented with one or more physical machines and can also be programmed to implement the functions of speech processor **66** and interface server **68**.

[0033] In addition to receiving requests over networks **58** and **60**, interface server **68** can receive a request over the world wide web **70**. In particular, a wireless device **74** can interact through wireless communication with a PCS **72**, which communicates over the world wide web **70** through a communication protocol such as, for example, the wireless application protocol (WAP). The WAP for communications over the Internet is known in the art.

[0034] System server **76** can communicate over the world wide web **78** with various service provides **80** to fulfill requests. In addition, system server **76** can communicate with credit card processing or other financial networks **86** in order to provide financial processing for fulfilling requests. Networks **86** can include known networks, including banking networks, for processing credit card transactions. As shown, service providers **80** and financial networks **86** can also send and receive communications through a PCS **82** and PSN **84**.

[0035] System server **76** can communicate directly over the world wide web **78** to a gateway **88** and base station **90** in order to provide communication directly with a wireless device **92**. Also as shown, communications can occur from system server **76** back through interface server **68** and speech processor **66** to the end user wireless devices **52** and **74** and wireline device **54**; system server **76** can also communicate directly with gateway **62**, as shown. Those

communications can provide, for example, confirmation of a request or information responsive to a request.

[0036] Network **50** illustrates fundamental hardware components for communications over the various types of networks shown. As known in the art, network **50** can include additional components and can also include components for providing services known in the art with respect to phone calls. For example, it can include a caller ID service to provide system server **76** with the phone number of the user's wireless or wireline device originating a communication. Also, network **50** can include other means for communication of data such as through satellite transmission. For transmission over the Internet, network **50** can use Transmission Control Protocol/Internet Protocol (TCP/IP) or other protocols.

Server Components

[0037] **FIG. 3** depicts a server **100** illustrating exemplary hardware components of system server **10** and other machines used by the system, such as speech processor **66** and interface server **68**. Server **100** includes a connection with a network **116** such as the Internet or other type of computer or phone networks, which may correspond with the networks shown in **FIGS. 1 and 2**. Server **100** typically includes a memory **102**, a secondary storage device **110**, a processor **112**, an input device **114**, a display device **108**, and an output device **106**.

[0038] Memory **102** may include random access memory (RAM) or similar types of memory, and it may store one or more applications **104** for execution by processor **112**. Applications **104** may correspond with software modules to perform processing for the functions described below. Secondary storage device **110** may include a hard disk drive, floppy disk drive, CD-ROM drive, or other types of non-volatile data storage, and it may correspond with the various databases shown in **FIG. 1**. Processor **112** may execute applications or programs stored in memory **102** or secondary storage **110**, or received from the Internet or other network **116**. Input device **114** may include any device for entering information into server **100**, such as a keyboard, key pad, cursor-control device, touch-screen (possibly with a stylus), or microphone. Display device **108** may include any type of device for presenting visual information such as, for example, a computer monitor, flat-screen display, or display panel. Output device **106** may include any type of device for presenting a hard copy of information, such as a printer, and other types of output devices include speakers or any device for providing information in audio form. Server **100** can possibly include multiple input devices, output devices, and display devices.

[0039] Although server **100** is depicted with various components, one skilled in the art will appreciate that this server can contain additional or different components. In addition, although aspects of an implementation consistent with the present invention are described as being stored in memory, one skilled in the art will appreciate that these aspects can also be stored on or read from other types of computer program products or computer-readable media, such as secondary storage devices, including hard disks, floppy disks, or CD-ROM; a carrier wave from the Internet or other network; or other forms of RAM or ROM. The computer-readable media may include instructions for controlling server **100** to perform a particular method.

Wireless Device Components

[0040] **FIG. 4** illustrates exemplary hardware components of a wireless device **120**, which may correspond with the exemplary wireless devices identified above. Wireless device **120** typically includes a memory **122**, a secondary storage device **130**, a processor **132**, an input device **134**, a display device **128**, an output device **126**, a transmitter/receiver **136**, and a short range transmitter/receiver **138**.

[0041] Memory **122** may include RAM or similar types of memory, and it may store one or more applications **124** for execution by processor **132**. Applications **124** may correspond with software modules to perform processing for the functions described below, and they may also include web browser programs for retrieving and displaying content from the Internet. Secondary storage device **130** may include a hard disk drive, floppy disk drive, CD-ROM drive, or other types of non-volatile data storage such as a ROM. Processor **132** may execute applications or programs stored in memory **122** or secondary storage **130**. Input device **134** may include any device for entering information into wireless device **120**, such as a keyboard, key pad, cursor-control device, touch-screen (possibly with a stylus), or microphone. Wireless device **120** can include multiple input devices; for example, it can include both a microphone and key pad for a cell phone. Display device **128** may include any type of device for presenting visual information such as, for example, a computer monitor, flat-screen display, or display panel. Output device **126** typically includes a speaker for providing information in audio form. It can also include a device for providing a hard copy of information such as a printer, or provide a port for a connection to a printer. Wireless device **120** can possibly include multiple input devices, output devices, and display devices.

[0042] Transmitter/receiver **136** provides for wireless communication with phone networks or computer networks such as is shown in **FIGS. 1 and 2**. Transmitter/receiver **136** can be implemented with known RF transmitters and receivers for providing cellular transmission between wireless device **120** and base stations such as base stations **56** and **90**, or it can be implemented with a wireless transmitter/receiver for other types of communication such as a satellite transmission.

[0043] Short range transmitter/receiver **138** provides for wireless short range communication with other wireless devices, and it can be implemented with transmitters and receivers that operate according to the IEEE standard 802.11 for local wireless networks or according to the standard referred to as the Bluetooth™ technology for direct wireless communication between local interactive wireless devices; that technology is explained in, for example, the Specification of the Bluetooth System, Core, v1.0 B, Dec. 1, 1999 and the Specification of the Bluetooth System, Profiles, v1.0 B, Dec. 1, 1999, both of which are incorporated herein by reference.

[0044] In addition, even if a wireless device does not contain short range transmitter/receiver **138**, technology exists to obtain an approximate geographic location of certain wireless devices. In particular, using multiple base stations the signal from a cellular phone, for example, can be triangulated in order to obtain an approximate geographic location of the cellular phone, including an indication of its vertical (altitude) location.

[0045] Although wireless device **120** is depicted with various components, one skilled in the art will appreciate that this wireless device can contain additional or different components. In addition, although aspects of an implementation consistent with the present invention are described as being stored in memory, one skilled in the art will appreciate that these aspects can also be stored on or read from other types of computer program products or computer-readable media, such as secondary storage devices, including hard disks, floppy disks, or CD-ROM; a carrier wave from the Internet or other network; or other forms of RAM or ROM. The computer-readable media may include instructions for controlling wireless device **120** to perform a particular method.

[0046] Exemplary hardware components for wireline devices, such as the examples provided above, can include the same components as wireless device **120** except without the transmitter/receiver **136** and the short range transmitter/receiver **138**.

Data Rendering

[0047] Data rendering provides the information for how to present data corresponding to concepts on a user device. The use of concepts is discussed in the related applications identified above. The concepts are associated with concept identifiers, which are used to index rendering instructions. A user device receives a data string and repeatedly parses it to obtain the concept identifiers and then retrieve the corresponding rendering instruction, which it uses to render the data on a display for the user device. It can also render and process interactive elements using the rendering instructions and interaction rules specifying how to process a user's selection of the interactive elements. The rendering instructions and interaction rules can be accessed remotely at the system server, or stored locally to perform the processing at the user device. Although concept identifiers are used to retrieve rendering instructions, other types of links or indexing of data with rendering instructions can be used.

[0048] **FIG. 5** is a flow chart of a method **150** for rendering data on a user device. Method **150** can be implemented, for example, with software or firmware modules on a server such as system server **10** and the user device such as device **120**, as necessary to perform the method. In method **150**, a user interface (UI) program receives incoming data (step **152**). The data can be transmitted, for example, as a data string formatted in XML. The UI program can be resident on the user device and execute steps of method **150** occurring at the user device.

[0049] Table 2 provides an example of a portion of a data string for airline flight information. As illustrated in Table 2, different concept identifiers can be used for different items, in this example flights and car rental companies. Also, the concept data is provided between identification of the concept, and certain types of data such as the alternate flight times are separate by the ";" symbol as a delimiter. XML nomenclature is known in the art, and other types of nomenclature can be used for transmitting data for rendering. In this exemplary nomenclature, tags are used to represent the concept identifiers.

TABLE 2

```
<XML!>
<concept ID>243<¢oncept ID>
    <Flight>1242<fflight>
    <Airline>United Airlines<Åirline>
    <Selected>True<ßelected>
. . .
    <Alternate Departure Flight Times>8:15; 9:15; 10:15
</Alternate Departure Flight Times>
. . .
<concept ID>266<concept ID>
    <Rental Car Company>Hertz<®ental Car Company>
. . .
<[X]ML!>
```

[0050] The UI program determines an operating system and user interface settings of the associated user device (step **154**). User interface settings can specify, for example, user-entered options for displaying data such colors, a font size, or other formatting. The UI program then begins parsing the data string to obtain a concept identifier (step **156**). It can identify a concept identifier according to the nomenclature for the data string. Upon obtaining a concept identifier, the UI program uses the concept identifier and optionally the settings to look up rendering instructions for the data (step **158**), and the UI program retrieves the rendering instructions (step **160**).

[0051] Table 3 provides an example of a data structure for storing rendering instructions. As illustrated in Table 3, the rendering instructions and identification of interactive elements can be indexed by concept identifiers, along with a type of user device and operation system. The rendering instructions provide the information for how to present the concept data corresponding to the concept identifier, and examples are provided below. The rendering instructions can be stored at the system server and downloaded; alternatively, they can be stored on the user device to allow the UI program to perform the processing locally.

[0052] The rendering instructions can be retrieved and based upon a number of factors such as, for example, the following: conventional or standard appearances for particular types of data; a type, size, and the capabilities of a display of the user device; a type of user device; an operating system for the user device; user preferences; user input; and a language identifier. Each of these factors can be used, for example, in conjunction with the concept identifiers to index the rendering instructions as illustrated in Table 3. Also, the rendering instructions can be stored in multiple locations. For example, the user device, for step **160**, can retrieve default rendering instructions from a remote server for data corresponding to a particular concept identifier and then locally retrieve additional instructions to modify or redefine the default rendering instructions based upon user input, preferences, or other factors. The user may wish to define, for example, particular colors for the data or other formatting, and the user device can redefine the default rendering instructions in order to change the default color or other formatting of the data to the user-defined color or other formatting after retrieving the default rendering instructions. Therefore, the user device can implement additional flexibility in rendering data based upon local instructions, remote instructions, or a combination.

TABLE 3

concept ID	UI/OS	Rendering Instructions	Interactive Elements
243	Palm Pilot, v. 3.5	instructions 1	element type 1
243	Windows 2000	instructions 2	element type 2
. . .			
266	Palm Pilot, v. 3.5	instructions 3	element type 3
266	Windows 2000	instructions 4	element type 4
. . .			
concept ID N	. . .	instructions N	element type N

[0053] The UI program renders the concept data and displays it on the user device according to the rendering instructions (step **162**). The UI program also determines if the concept data includes an interactive element (step **164**). If so, the UI program sets the element in the display on the user device according to the corresponding data and the rendering instructions (step **166**).

[0054] The UI program determines whether more concepts exist to render (step **168**). It can make this determination by detecting whether it has reached the end of the data string according to the nomenclature or as indicated by a particular code. If more concepts exist, the UI program returns to step **156** to continue to parse to data string in order to obtain the next concept and render the corresponding concept data.

[0055] **FIG. 6** is a flow chart of a method **170** for re-rendering interactive elements based upon a user's selection of them. Method **170** can be implemented, for example, with software or firmware modules on a server such as system server **10** and the user device, as necessary to perform the method. In method **170**, the UI program detects a user's selection of an interactive element on the display for the user device (step **172**). Upon detecting the selection, the UI program obtains the corresponding concept identifier (step **174**). The concept data representing an interactive element is linked with the corresponding concept identifiers, as explained in the related application identified above, permitting the UI program to obtain a concept identifier for the selected concept data.

[0056] The UI program uses the concept identifier and interactive element to look up interaction rules and rendering instructions for the element (step **178**) and retrieve the interaction rules and rendering instructions (step **178**). Table 4 provides an example of a data structure for indexing interaction rules according to types of interactive elements. Concept identifiers can also be associated with interactive elements, as represented by concept data, and used to index interaction rules. The interaction instructions can be stored at the system server and downloaded; alternatively, they can be stored on the user device to allow the UI program to perform the processing locally.

TABLE 4

Interactive Element	Interaction Rules
interactive element type 1	rules 1
interactive element type 2	rules 2
. . .	
interactive element type N	rules N

[0057] The UI program re-renders the interactive element on the user device according to the interaction rules and the rendering instructions (step **180**). The rendering instructions and interaction rules provide the information for how to present and change the appearance of the corresponding interactive element based upon the user's selection of it. Examples are provided below.

[0058] **FIG. 7** is a diagram **190** illustrating rendering of a data elements and interactive elements on a display for a user device. Diagram **190** illustrates that data for rendering can include one or more data elements **192**, **194**, and **196**. These data elements represent static data that does not usually change upon re-rendering and is not necessarily intended for selection by a user; rather, these elements convey information to the user. These elements can take on a wide variety types of information based upon the rendering instructions and can include, for example, text, graphics, alphanumeric data, symbols, icons, or audiovisual information. The formatting based upon the rendering instructions can include, for example, the following for the data: various fonts, shading, colors, icons, symbols, lines, graphics, positioning, or anything affecting the visual appearance of the data.

[0059] The displayed information can also include one or more interactive elements **198**, **200**, and **202**. The interactive elements can also provide information to the user and are intended for selection by the user to perform a command such as changing the displayed and entered data corresponding to the interactive element, changing the appearance of the data, or retrieving additional information.

[0060] **FIG. 8** is a diagram of an exemplary display **210** on a user device illustrating rendering of data including interactive elements according to diagram **190** and the methods described above. Display **210** includes as an example providing airline flight information, and it includes both data elements and interactive elements. A data element **214** is an "airplane" icon and illustrates how the data elements can include icons or symbols relating to the displayed information in order to, for example, provide a visually-appealing display. Data element **216** provides the flight information, in this example including a flight number, airline company, and seat classification.

[0061] Data elements **218** and **220** indicate departure and arrival cities. These data elements are each shown enclosed within a box to represent an interactive element in this example. If a user selects the departure or arrival city, for example, the displayed box may be shown in a different color than the city name to indicate its selection, and additional cities can be displayed and selected in the box. Upon the user's selection of a new city, the UI program re-renders the data to show the new city in the box. The interaction rules determine how the element changes upon selection of it, in this example changing a color of the box. Interactive elements **218** and **220** can be selected by a user tapping on a touch-screen at the location of those displayed elements, for example, or through other types of user-entered commands.

[0062] Data elements **222** and **226** indicate departure and arrival times for the flight, and a displayed line **224** underneath the departure time indicates that additional departure times are available. Upon a user's selection of the departure time **222**, additional times can be displayed for selection by

the user. A data element **212** represents a box for selection by the user to reserve the flight in this example. Therefore, if a user selects box **212**, the UI program, according to the interaction rules, inserts a "check" mark in the box. Likewise, if box **212** already contains a "check" mark, a user can select it again to cancel the flight reservation, and according to the interaction rules the UI program removes the displayed "check" mark from the box.

[**0063**] **FIG. 9** is a diagram of another exemplary display **230** on a user device illustrating rendering of data and including interactive elements. Display **230** includes a section **232** displaying in this example various travel-related options. A section **234** can display rental car reservations, a section **236** can display a limousine reservation, a section **238** can display airline flight reservations, and a section **240** i can display hotel reservations. A displayed "triangle" symbol **242** indicates a current one of the sections **234**, **236**, **238**, and **240** for selection.

[**0064**] Selection of a displayed "up" arrow **250** causes triangle **242** to move upward; for example, from section **238** to section **236**. Selection of a displayed "down" arrow **252** causes triangle **242** to move downward; for example, from section **238** to section **240**. A section **246** permits the user to select one of the sections **234**, **236**, **238**, and **240**. For example, by selecting section **246**, the user selects current section **238** and can then enter or select a flight reservation. By selecting section **244**, the user deselects current section **238** and can cancel a flight reservation. The selection of sections **234**, **236**, **238**, and **240**, and movement of triangle **242**, are re-rendered based upon the interaction rules. They can be selected through selection of the sections of a touch-screen presenting them, or other types of user-entered commands.

[**0065**] While the present invention has been described in connection with an exemplary embodiment, it will be understood that many modifications will be readily apparent to those skilled in the art, and this application is intended to cover any adaptations or variations thereof. For example, various types of user devices, hardware components for the devices and servers, and types of network transmissions may be used without departing from the scope of the invention. This invention should be limited only by the claims and equivalents thereof.

What is claimed is:

1. A method for rendering data on a user device based upon concepts, comprising:

receiving incoming data at a user device, the data including concept identifiers for use in identifying concepts relating to the data;

retrieving rendering instructions based upon the concept identifiers; and

rendering the data on the user device based upon the rendering instructions.

2. The method of claim 1, further including:

identifying interactive elements within the data; and

setting the interactive elements according to the data and the rendering instructions.

3. The method of claim 2, further including:

detecting selection of one of the interactive elements;

retrieving interaction rules based upon the interactive element; and

re-rendering the data based upon the interaction rules.

4. The method of claim 3 wherein the re-rendering step includes retrieving additional data from a remote server based upon the selection of the interactive element.

5. The method of claim 1 wherein the receiving step includes receiving as the data a string of data and corresponding tags representing the concept identifiers.

6. The method of claim 5 wherein the rendering step including parsing the string of data for presentation according to the rendering instructions.

7. The method of claim 1 wherein the retrieving step includes locally retrieving the rendering instructions at the user device.

8. The method of claim 1 wherein the rendering step includes formatting an appearance of visual elements for the data.

9. The method of claim 8 wherein the formatting step includes selecting, based upon the rendering instructions, at least one of the following: a particular color for presenting the data, a particular icon for presenting the data, positioning of the data, or a particular symbol for presenting the data.

10. The method of claim 1 wherein the retrieving step includes selecting the rendering instructions based upon a particular type of the user device.

11. An apparatus for rendering data on a user device based upon concepts, comprising:

a receive module for receiving incoming data at a user device, the data including concept identifiers for use in identifying concepts relating to the data;

a retrieve module for retrieving rendering instructions based upon the concept identifiers; and

a render module for rendering the data on the user device based upon the rendering instructions.

12. The apparatus of claim 11, further including:

a module for identifying interactive elements within the data; and

a module for setting the interactive elements according to the data and the rendering instructions.

13. The apparatus of claim 12, further including:

a module for detecting selection of one of the interactive elements;

a module for retrieving interaction rules based upon the interactive element; and

a module for re-rendering the data based upon the interaction rules.

14. The apparatus of claim 13 wherein the module for re-rendering includes a module for retrieving additional data from a remote server based upon the selection of the interactive element.

15. The apparatus of claim 11 wherein the receive module includes a module for receiving as the data a string of data and corresponding tags representing the concept identifiers.

16. The apparatus of claim 15 wherein the render module including a module for parsing the string of data for presentation according to the rendering instructions.

17. The apparatus of claim 11 wherein the retrieve module includes a module for locally retrieving the rendering instructions at the user device.

18. The apparatus of claim 11 wherein the render module includes a module for formatting an appearance of visual elements for the data.

19. The apparatus of claim 18 wherein the module for formatting includes a module for selecting, based upon the rendering instructions, at least one of the following: a particular color for presenting the data, a particular icon for presenting the data, positioning of the data, or a particular symbol for presenting the data.

20. The apparatus of claim 11 wherein the retrieve module includes a module for selecting the rendering instructions based upon a particular type of the user device.

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