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Kurganov

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(54) **PERSONAL VOICE-BASED INFORMATION RETRIEVAL SYSTEM**

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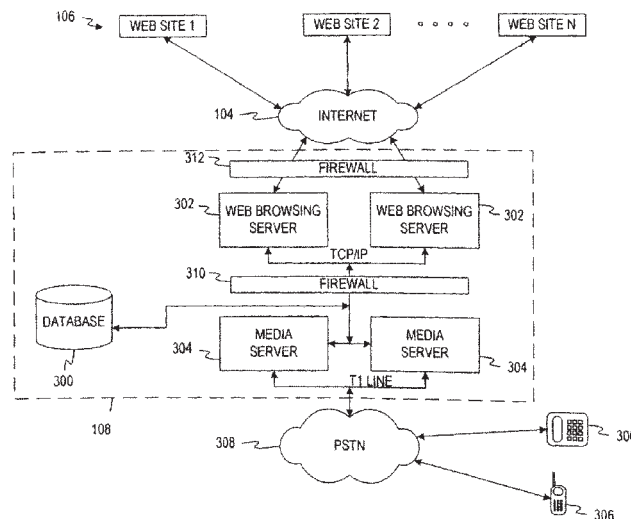
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(57)

ABSTRACT

The present invention relates to a system for retrieving information from a network such as the Internet. A user creates a user-defined record in a database that identifies an information source, such as a web site, containing information of interest to the user. This record identifies the location of the information source and also contains a recognition grammar based upon a speech command assigned by the user. Upon receiving the speech command from the user that is described within the recognition grammar, a network interface system accesses the information source and retrieves the information requested by the user.

26 Claims, 5 Drawing Sheets



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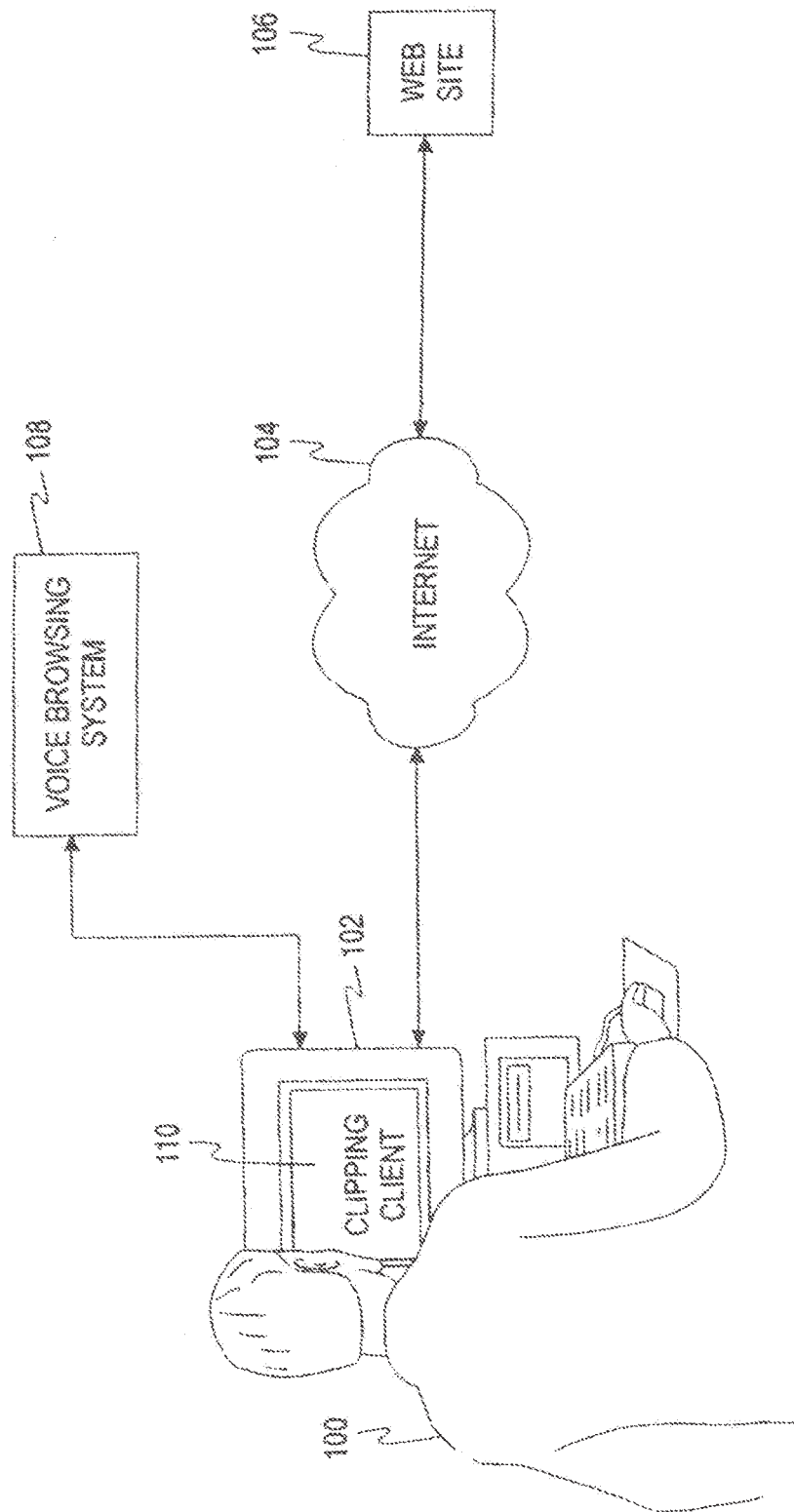


FIG. 1

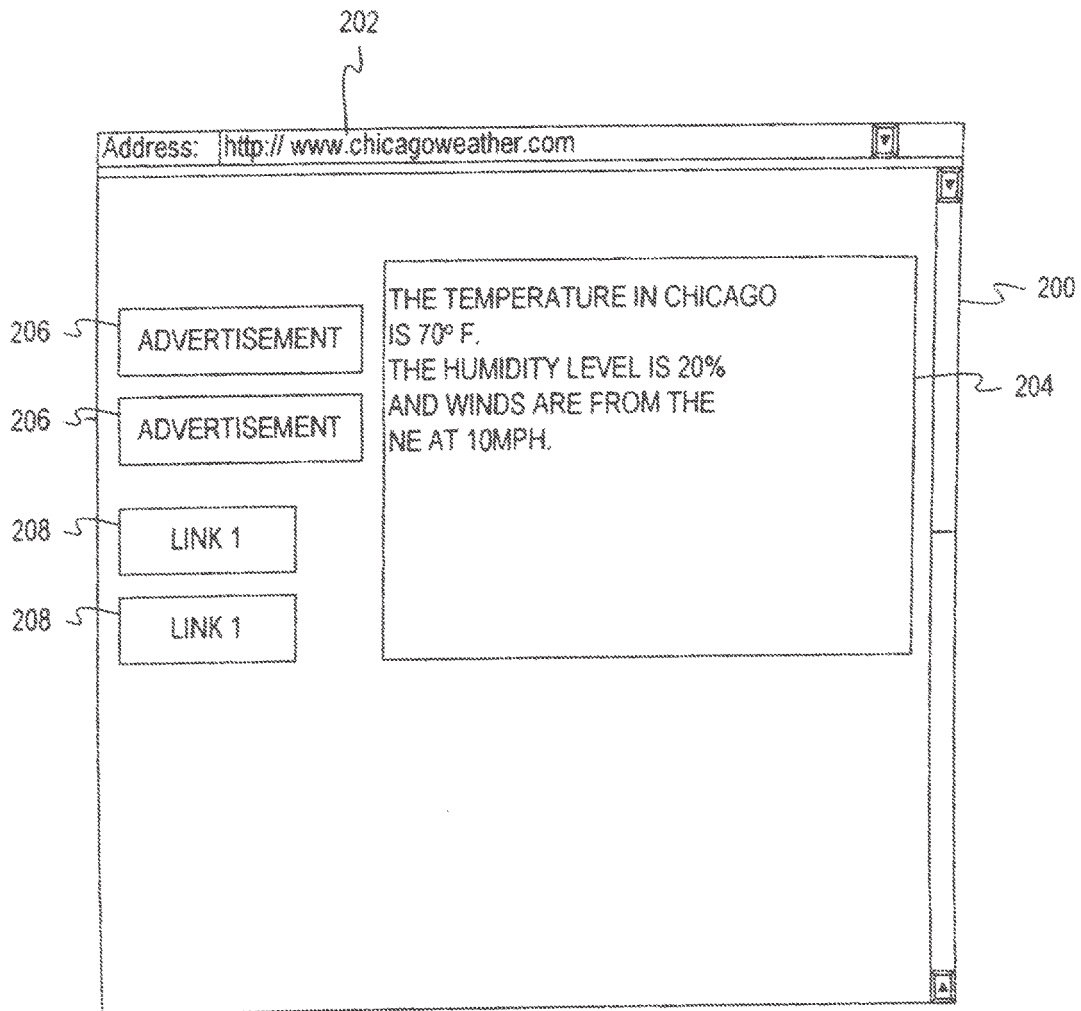


FIG. 2

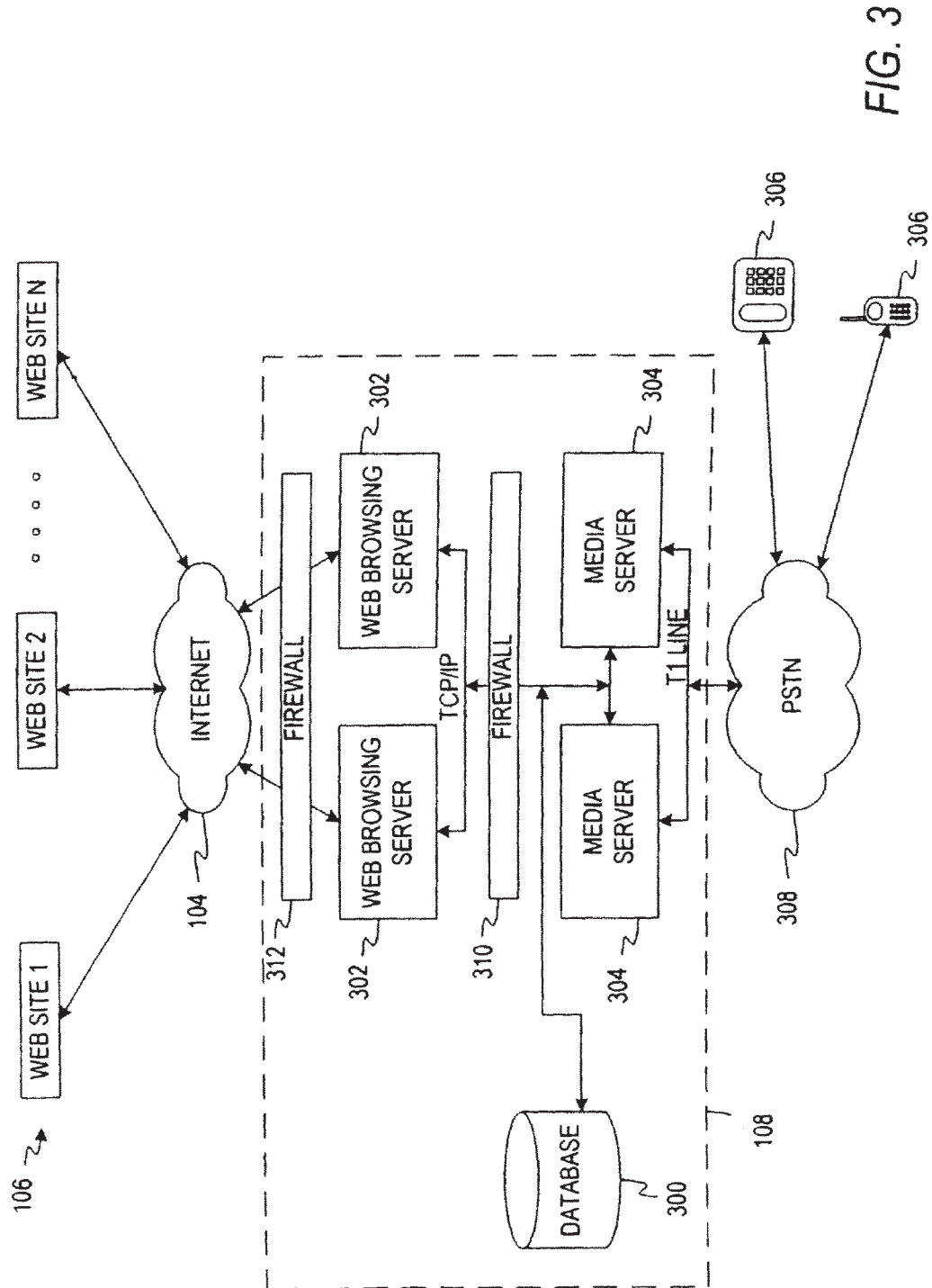


FIG. 3

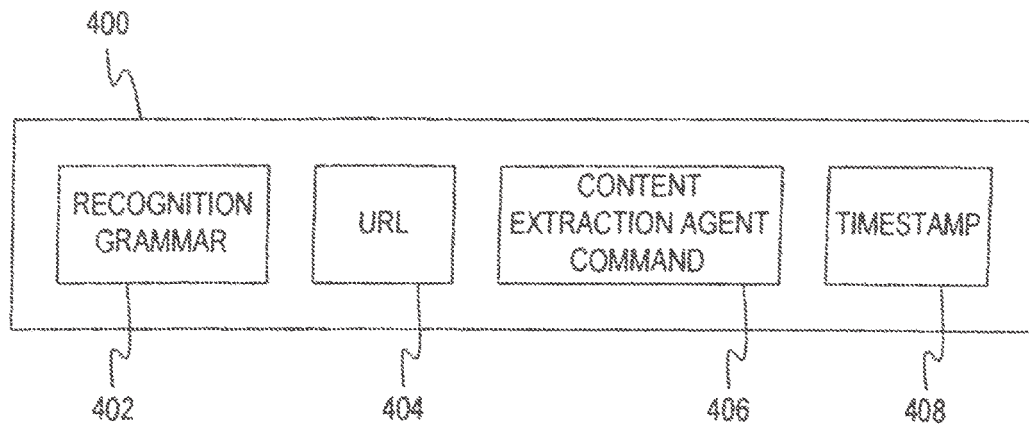


FIG. 4

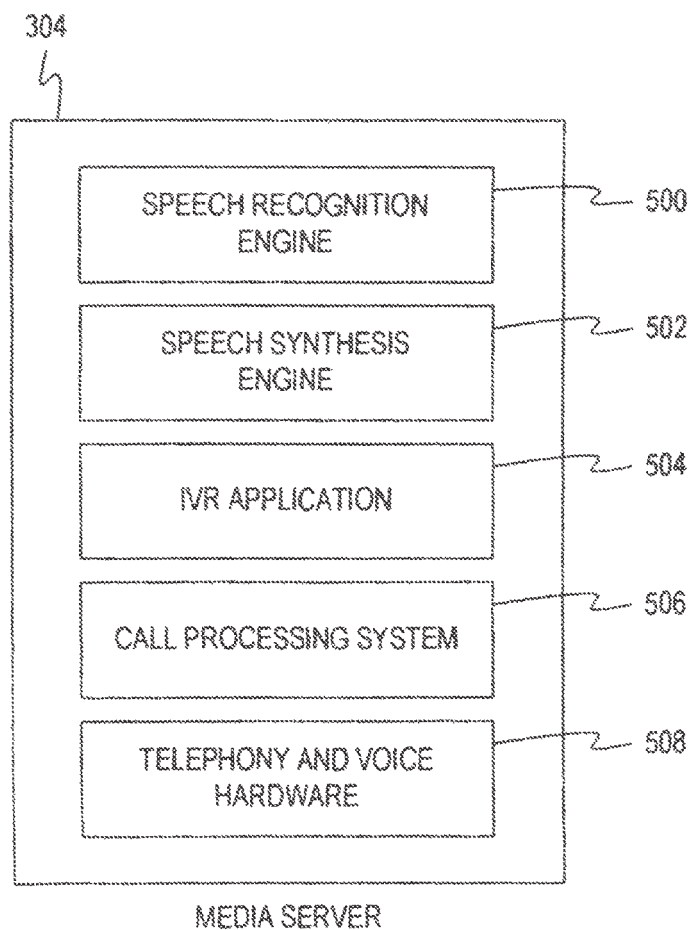


FIG. 5

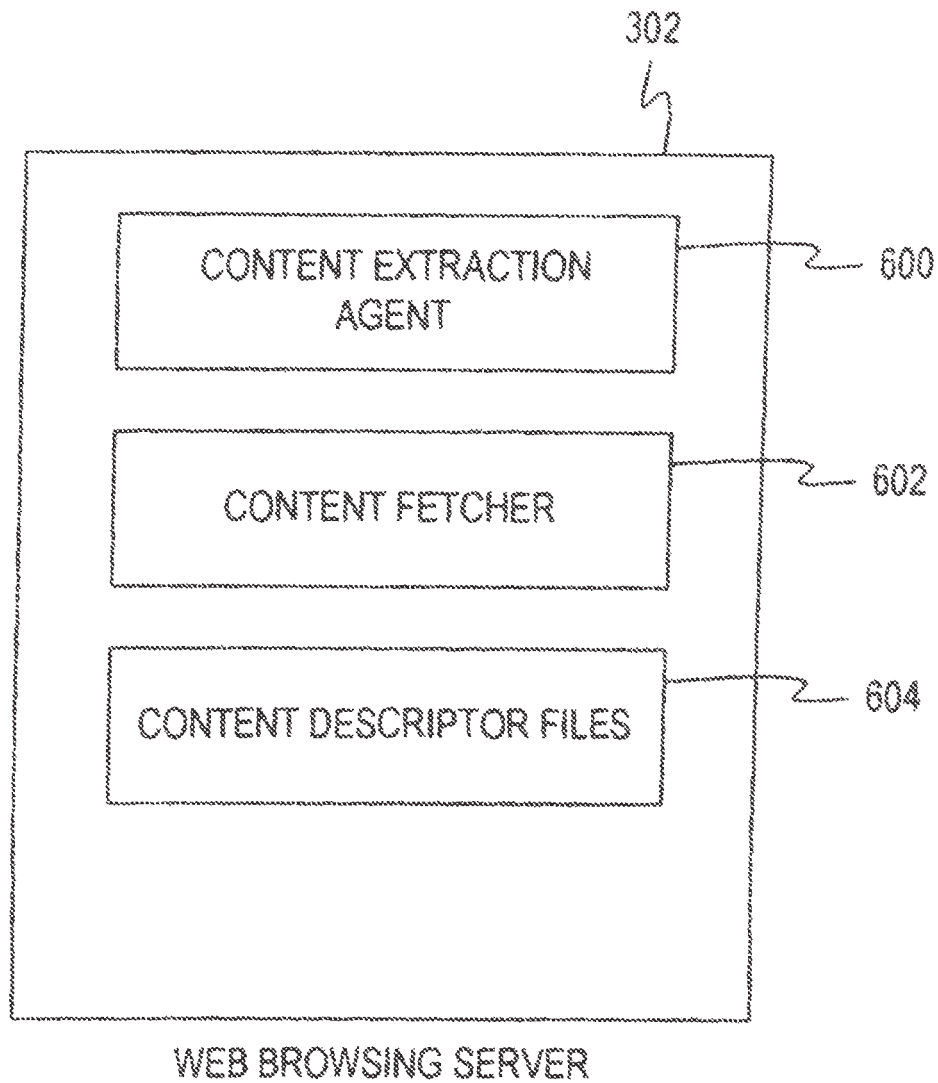


FIG. 6

1

PERSONAL VOICE-BASED INFORMATION RETRIEVAL SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is a continuation of U.S. Utility application Ser. No. 12/787,801, filed May 26, 2010, which is a continuation of U.S. Utility application Ser. No. 11/711,773, filed Jun. 29, 2007, which is a continuation of U.S. Utility application Ser. No. 09/777,406, dated Feb. 6, 2001, which claims priority to U.S. Provisional Patent Application No. 60/180,343, filed Feb. 4, 2000, which are incorporated by reference herein in their entirety.

FIELD OF THE INVENTION

The present invention relates generally to the field of providing information IO access. In particular, the invention relates to a personalized system for accessing information from the Internet or other information sources using speech commands.

BACKGROUND OF THE INVENTION

Popular methods of information access and retrieval using the Internet or other computer networks can be time-consuming and complicated. A user must frequently wade through vast amounts of information provided by an information source or web site in order obtain a small amount of relevant information. This can be time-consuming, frustrating, and, depending on the access method, costly. A user is required to continuously identify reliable sources of information and, if these information sources are used frequently, repeatedly access these sources.

Current methods of accessing information stored on computer networks, such as Wide Area Networks (WANs), Local Area Network (LANs) or the Internet, require a user to have access to a computer. While computers are becoming increasingly smaller and easier to transport, using a computer to access information is still more difficult than simply using a telephone. Since speech recognition systems allow a user to convert his voice into a computer-usable message, telephone access to digital information is becoming more and more feasible. Voice recognition technology is growing in its ability to allow users to use a wide vocabulary.

Therefore, a need exists for an information access and retrieval system and method that allows users to access frequently needed information from information sources on networks by using a telephone and simple speech commands.

SUMMARY OF THE INVENTION

One object of the preferred embodiment of the present invention is to allow users to customize a voice browsing system.

A further object of the preferred embodiment is to allow users to customize the information retrieved from the Internet or other computer networks and accessed by speech commands over telephones.

Another object of the preferred embodiment is to provide a secure and reliable retrieval of information over the Internet or other computer networks using predefined verbal commands assigned by a user.

The present invention provides a solution to these and other problems by providing a new system for retrieving

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information from a network such as the Internet. A user creates a user-defined record in a database that identifies an information source, such as a web site, containing information of interest to the user. This record identifies the location of the information source and also contains a recognition grammar assigned by the user. Upon receiving a speech command from the user that is described in the assigned recognition grammar, a network interface system accesses the information source and retrieves the information requested by the user.

In accordance with the preferred embodiment of the present invention, a customized, voice-activated information access system is provided. A user creates a descriptor file defining specific information found on a web site the user would like to access in the future. The user then assigns a pronounceable name or identifier to the selected content and this pronounceable name is saved in a user-defined database record as a recognition grammar along with the URL of the selected web site.

In the preferred embodiment, when a user wishes to retrieve the previously defined web-based information, a telephone call is placed to a media server. The user provides speech commands to the media server that are described in the recognition grammar assigned to the desired search. Based upon the recognition grammar, the media server retrieves the user-defined record from a database and passes the information to a web browsing server which retrieves the information from associated web site. The retrieved information is then transmitted to the user using a speech synthesis software engine.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 displays a personal information selection system used with the preferred embodiment of the present invention;

FIG. 2 displays a web page displayed by the clipping client of the preferred embodiment;

FIG. 3 is a block diagram of a voice browsing system used with preferred embodiment of the present invention;

FIG. 4 is a block diagram of a user-defined database record created by preferred embodiment of the present invention;

FIG. 5 is a block diagram of a media server used by the preferred embodiment; and

FIG. 6 is a block diagram of a web browsing server used by the preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention uses various forms of signal and data transmission to allow a user to retrieve customized information from a network using speech communication. In the preferred embodiment of the present invention, a user associates information of interest found on a specific information source, such as a web site, with a pronounceable name or identification word. This pronounceable name/identification word forms a recognition grammar in the preferred embodiment. When the user wishes to retrieve the selected information, he may use a telephone or other voice enabled device to access a voice browser system. The user then speaks a command described in the recognition grammar associated with the desired information. The voice browsing system then accesses the associated information source and returns to the user, using a voice synthesizer, the requested information.

Referring to FIG. 1, a user **100** uses a computer **102** to access a network, such as a WAN, LAN, or the Internet, containing various information sources [n the preferred embodiment, the user **100** access the Internet **104** and begins searching for web sites **106**, which are information sources that contain information of interest to the user. When the user **100** identifies a web site **106** containing information the user would like to access using only a voice enabled device, such as a telephone, and the voice browsing system **108**, the user initiates a “clipping client” engine **110** on his computer **102**.

The clipping client **110** allows a user **100** to create a set of instructions for use by the voice browsing system **108** in order to report personalized information back to the user upon request. The instruction set is created by “clipping” information from the identified web site. A user **100** may be interested in weather for a specific city, such as Chicago. The user **100** identifies a web site from which he would like to obtain the latest Chicago weather information. The clipping client **110** is then activated by the user **100**.

The clipping client **110** displays the selected web site in the same manner as a conventional web browser such as Microsoft's® Internet Explorer. FIG. 2 depicts a sample of a web page **200** displayed by the clipping client **110**. The user **100** begins creation of the instruction set for retrieving information from the identified web site by selecting the uniform resource locator (URL) address **202** for the web site (i.e., the web site address). In the preferred embodiment, this selection is done by highlighting and copying the URL address **202**. Next, the user selects the information from the displayed web page that he would like to have retrieved when a request is made. Referring to FIG. 2, the user would select the information regarding the weather conditions in Chicago **204**. The web page **200** may also contain additional information such as advertisements **206** or links to other web sites **208** which are not of interest to the user. The clipping client **110** allows the user to select only that portion of the web page containing information of interest to the user. Therefore, unless the advertisements **206** and links **208** displayed on the web page are of interest to the user, he would not select this information. Based on the web page information **204** selected by the user, the clipping client **110** creates a content descriptor file containing a description of the content of the selected web page. This content descriptor file indicates where the information selected by the user is located on the web page. In the preferred embodiment, the content descriptor file is stored within the web browsing server **302** shown in FIG. 3. The web browsing server **302** will be discussed below.

Table 1 below is an example of a content descriptor file created by the clipping client of the preferred embodiment. This content descriptor file relates to obtaining weather information from the web site www.cnn.com.

TABLE 1

```

table name : portalServices
column :
  service
content:
  weather
column:
  config
content:
  [cnn]
Input=_zip
URL=http://cgi.cnn.com/cgi-bin/weather/redirect?zip= zip
Pre-filter="\n"

```

TABLE 1-continued

```

Pre-filter = "< [ "< "> ] + > "
Pre-filter=/s+/ I
Pre-filter=" [ \ ( \ ) \ I ] " ! "
5 Output=_location
Output=first_day_name
Output=first_day_weather
Output=first_day_high_F
Output=first_day_high_C
Output=first_day_low_F
10 Output=first_day_low_C
Output=second_day_name
Output=second_day_weather
Output=second_day_high_F
Output=second_day_high_C
Output=second_day_low_F
15 Output=second_day_low_C
Output=third_day_name
Output=third_day_weather
Output=third_day_high_F
Output=third_day_high_C
Output=third_day_low_F
20 Output=third_day_low_C
Output=fourth_day_name
Output=fourth_day_weather
Output=fourth_day_high_F
Output=fourth_day_high_C
Output=fourth_day_low_F
25 Output=fourth_day_low_C
Output=undef
Output=_current_time
Output=fourth_day_low_C
Output=undef
Output=_current_time
Output=_current_month
30 Output=_current_day
Output=_current_weather
Output=_current_temperature_F
Output=_current_temperature_C
Output=_humidity
Output=_wind
35 Output=_pressure
Output=_sunrise
Output=_sunset
Regular_expression=WEB SERVICES: (.+) Forecast FOUR-DAY
FORECAST (\S+)
(\S+) HIGH
(\S+) F (\S+) C LOW (\S+) F (\S+) C (\S+) (\S+) HIGH (\S+) F
40 (\S+) C LOW
(\S+)
) F (\S+) C (\S+) (\S+) HIGH (\S+) F (\S+) C LOW (\S+) F
(\S+) C (\S+) (\S+)
HIGH
~(\S+) C LOW (\S+) F (\S+) C WEATHER MAPS RADAR ( .+) Forecast
45 CURRENT CONDITIONS
(.+) !local!, (\S+) (\S+) (.+) Temp: (\S+) F,
(\S+) C Rel.
Humidity: (
\S+) Wind: (.+) Pressure: ( .+) Sunrise: ( .+) Sunset: ( .+)

```

Finally, the clipping client **110** prompts the user to enter an identification word or phrase that will be associated with the identified web site and information. For example, the user could associate the phrase “Chicago weather” with the selected URL **202** and related weather information **204**. The identification word or phrase is stored as a personal recognition grammar that can now be recognized by a speech recognition engine of the voice browsing system **108** which will be discussed below. The personal recognition grammar, URL address **202**, and a command for executing a content extraction agent are stored within a database used by the voice browser system **108** which will be discussed below.

The voice browsing system **108** used with the preferred embodiment will now be described in relation to FIG. 3. A database **300** designed by Webley Systems Incorporated is connected to one or more web browsing servers **302** as well as to one or more media servers **304**. The database may store

information on magnetic media, such as a hard disk drive, or it may store information via other widely acceptable methods for storing data, such as optical disks. The media servers 304 function as user interface systems that provide access to the voice browsing system 108 from a user's voice enabled device 306 (i.e., any type of wireline or wireless telephone, Internet Protocol (IP) phones, or other special wireless units). The database 300 contains a section that stores the personal recognition grammars and related web site information generated by the clipping client 110. A separate record exists for each web site defined by the user. An example of a user-defined web site record is shown in FIG. 4. Each user-defined web site record 400 contains the recognition grammar 402 assigned by the user, the associated Uniform Resource Locator (URL) 404, and a command that enables the "content extraction agent" 406 and retrieves the appropriate content descriptor file required to generate proper requests to the web site and to properly format received data. The web-site record 400 also contains the timestamp 408 indicating the last time the web site was accessed. The content extraction agent is described in more detail below.

The database 300 may also contain a listing of pre-recorded audio files used to create concatenated phrases and sentences. Further, database 300 may contain customer profile information, system activity reports, and any other data or software servers necessary for the testing or administration of the voice browsing system 108.

The operation of the media servers 304 will now be discussed in relation to FIG. 5. The media servers 304 function as user interface systems since they allow a user to access the voice browsing system 108 via a voice enabled device 306. In the preferred embodiment, the media servers 304 contain a speech recognition engine 500, a speech synthesis engine 502, an Interactive Voice Response (IVR) application 504, a call processing system 506, and telephony and voice hardware 508 that is required to enable the voice browsing system 108 to communicate with the Public Switched Telephone Network (PSTN) 308. In the preferred embodiment, each media server is based upon Intel's Dual Pentium III 730 MHz microprocessor system.

The speech recognition function is performed by a speech recognition engine 500 that converts voice commands received from the user's voice enabled device 10 (i.e., any type of wire line or wireless telephone, Internet Protocol (IP) phones, or other special wireless units) into data messages. In the preferred embodiment voice commands and audio messages are transmitted using the PSTN 308 and data is transmitted using the TCP/IP communications protocol. However, one skilled in the art would recognize that other transmission protocols may be used. Other possible transmission protocols would include SIP/VoIP (Session Initiation Protocol/Voice over IP), Asynchronous Transfer Mode (ATM) and Frame Relay. A preferred speech recognition engine is developed by Nuance Communications of 1380 Willow Road, Menlo Park, Calif. 94025 (www.nuance.com). The Nuance engine capacity is measured in recognition units based on CPU type as defined in the vendor specification. The natural speech recognition grammars (i.e., what a user can say that will be recognized by the speech recognition engine) were developed by Webley Systems.

In the preferred embodiment, when a user access the voice browsing system 108, he will be prompted if he would like to use his "user-defined searches." If the user answers affirmatively, the media servers 304 will retrieve from the database 300 the personal recognition grammars 402 defined by the user while using the clipping client 10.

The media servers 304 also contain a speech synthesis engine 502 that converts the data retrieved by the web browsing servers 302 into audio messages that are transmitted to the user's voice enabled device 306. A preferred speech synthesis engine is developed by Lernout and Hauspie Speech Products, 52 Third Avenue, Burlington, Mass. 01803 (www.lhslcom).

A further description of the web browsing server 302 will be provided in relation to FIG. 6. The web browsing servers 302 provide access to data stored on any computer network including the Internet 104, WANs or LANs. The web browsing servers 302 receive responses from web sites 106 and extract the data requested by the user. This task is known as "content extraction." The web browsing server 302 is comprised of a content extraction agent 600, a content fetcher 602, and the content descriptor file 604. Each of these are software applications and will be discussed below.

Upon receiving a user-defined web site record 400 from the database 300 in response to a user request, the web browsing server 302 invokes the "content extraction agent" command 406 contained in the record 400. The content extraction agent 600 retrieves the content descriptor file 604 associated with the user-defined record 400. As mentioned, the content descriptor file 604 directs the extraction agent where to extract data from the accessed web page and how to format a response to the user utilizing that data. For example, the content descriptor file 604 for a web page providing weather information would indicate where to insert the "city" name or ZIP code in order to retrieve Chicago weather information. Additionally, the content descriptor file 604 for each supported URL indicates the location on the web page where the response information is provided. The extraction agent 600 uses this information to properly extract from the web page the information requested by the user.

The content extraction agent 600 can also parse the content of a web page in which the user-desired information has changed location or format. This is accomplished based on the characteristic that most hypertext documents include named objects like tables, buttons, and forms that contain textual content of interest to a user. When changes to a web page occur, a named object may be moved within a document, but it still exists. Therefore, the content extraction agent 600 simply searches for the relevant name of desired object. In this way, the information requested by the user may still be found and reported regardless of changes that have occurred.

Table 2 below contains source code for a content extraction agent 600 used by the preferred embodiment.

TABLE 2

```
# ! /usr/ local/www/bin/syberl5
#$Header:
/usr/local/cvsroot/webley/agents/service/web_dispatch.pl,v
1.6
# Dispatches all web requests
#http://wcorp.itn.net/cgi/flstat?carrier=ua&flight_no=155&mcn
_abbrev=jul&date=
6&stamp=ChLN~PdbumE*itn/ord,itn/cb/sprint_hd
#http://cig.cnnfn.cm/flightview/rlm?airline=amt&number=300
require "config_tmp.pl";
# check parameters
die "Usage: $0 service [params]\n" if $#ARGV < 1;
#print STDERR @ARGV;
# get parameters
my ( $service, @param ) = @ARGV;
# check service
My ($services = (
```

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TABLE 2-continued

```

weather_cnn => 'webget.pl weather_cnn',
weather_lycos => 'webget.pl

'weather_lycos',
weather_weather => 'webget.pl
weather_weather',
weather_snap => 'webget.pl
weather_snap',
weather_infospace => 'webget.pl
weather_infospace',
stockQuote_yahoo => 'webget.pl stock',
flightStatus_itn => 'webget.pl
flight_delay',
yellowPages_yahoo => 'yp_data.pl',
yellowPages_yahoo => 'yp_data.pl',
newsHeaders_newsreal => 'news.pl',
newsArticle_newsreal => 'news.pl',
);

# test param
my $date= 'date';
chop ( $date );
my ( $short_date ) = $date =~ / \s+({w3}\s+d{1, 2}) \s+;/
my %Test = (
    weather_cnn => '60053',
    weather_lycos => '60053',
    weather_weather => '60053',
    weather_snap => '60053',
    weather_infospace => '60053',
    stockQuote_yahoo => 'msft',
    flightStatus_itn => 'ua 155 ' .

$short_date,
    yellowPages_yahoo => 'tires 60015',
    newsHeaders_newsreal => ' 1 ',
    newsArticle_newsreal => ' 1 1 ',
    );

die "$date: $0: error: no such service: $service (check
this script) \n"
unless $Services{ $service };
# prepare absolute path to run other scripts
my ( $path, $script ) = $0 =~ m/^(.*)/([ ^ ] * ) | ;
# store the service to compare against datatable
my $service_stored = $service;
# run service
while( ! ( $response = '$path$Services { $service } @param' )
) (
    # response failed
    # check with test parameters
    $response = '$path$Services { $service } $Test{
$service }',
    If ( $response ) {
        $service = &switch_service( $service );
        print "wrong parameter values were supplied;
$service -
@param\n";
        # die "$date: $0: error: wrong parameters: $service
-
@param\n";
    }
    else {
        # change priority and notify
        $service = &increase_attempt( $service );
    }
}
# output the response
print $response;
sub increase_attempt {
    my ( $service ) = @_;
    my ( $service_name ) split( /_/, $service );
    print STDERR "$date: $0: attn: changing priority for
service:
$service\n";
    # update priority
    &db_query( "update mcServiceRoute "
        . "set priority = ( select max( priority for
) from
mcServiceRoute "
        . "where service = '$service_name' ) + 1,
        . "date = getdate( ), "
        . "attempt = attempt + 1 "
        . "where route = '$script $service' " );
    #
    print "---$route==\n";

```

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TABLE 2-continued

```

# find new route
my $route @ { &db_query( "select route from
mcServiceRoute "
        . "where service =
'$service_name' "
        . "and attempt < 5
"
        . "order by
priority " )
    } -> [ 0 ] { route };
&db_query( "update mcServiceRoute "
    . "set attempt = 0 "
    . "where route = '$script $service' " );
if ( $route eq "$script $service_stored" );
( $service_name, $service ) = split( /\s+/, $route );
die "$date: $0: error: no route for the service:
$service (add
More) \n"
    unless $service;
    return $service;
}
sub switch_service {
    my ( $service ) = @_;
    my ( $service_name ) = split( /_/, $service );
    print STDERR "$date: $0: attn: changing priority for
service:
$service\n";
    # update priority
    &db_query( "update mcServiceRoute "
        . "set priority = ( select max( priority for
) from
mcServiceRoute "
        . "where service = '$service_name' ) + 1,
        . "date ~ getdate ( ) "
        . "where route = '$script $service' " );
    #
    print "---$route==\n";
    - # find new route
    my $route = @ { &db_query( "select route from
mcServiceRoute "
        . "where service =
'$service_name' "
        . "and attempt < 5
"
        . "order by
priority " )
        } -> [ 0 ] { route };
    die " $ date : $ 0 : error : there is the only service:
$route (add
more) \n"
        if ( $route eq "$script $service"
            or $route eq "$script $service_stored" );
    (service_name, $service ) = split( /\s+/, $route );
    die "$date: $0: error: no route for the service:
$service (add
more)\n"
        unless $service;
        return $service;
}

```

Table 3 below contains source code of the content fetcher 602 used with the content extraction agent 600 to retrieve information from a web site

TABLE 3

```

#!/usr/local/www/bin/syber15
#-T
# -w
# $Header:
/usr/local/cvsroot/webley/agents/service/webget.pl, v 1.4
# Agent to get info from the web.
# Parameters: service_name [service_parameters], i.e. stock
msft or weather
60645
# Configuration stored in files service_name.ini
# if this file is absent the configuration is received from
mcServices table
# This script provides autoupdate to datatable if the .ini

```

TABLE 3-continued

```

file is newer.
$debug = 1;
use URI : : URL;
use LWP : : UserAgent;
use HTTP : : Request : : Common;
use Vail : : VarList;
use Sybase : : CT lib;
use HTTP : : Cookies;
#print "Sybase: :CT lib $DB_USR, $DB_PWD, $DB_SRV";
Open ( STDERR, ">>$0.log" ) if $debug;
#open ( STDERR, ">>STDOUT" );
$log = 'date';
#$response = '.url.pl
http://cgi.cnn.com/cgi-bin/weather/redirect?zip=60605';
#$response = 'pwd';
#print STDERR "pwd = $response\n";
#$response = 'ls';
#print STDERR "ls = $response\n";
chop ( $log );
$log .= "pwd=" . 'pwd';
chop ( $log );
#$debug2 = 1;
my $service = shift;
$log .= " $service: ", join( ' ', @ARGV ) . "\n";
print STDERR $log if $debug;
#$response = '.url.pl
"http://cgi.cnn.com/cgi-bin/weather/redirect?zip=60605" ;
my @ini = &read_ini ( $service );
chop ( @ini );
my $section = "";
do ( $section = &process_section( $section ) ) while
$section;
#$response = '.url.pl
http://cgi.cnn.com/cgi-bin/weather/redirect?zip=60605" ;
exit;
#####
sub read_ini {
    my ( $service ) = @_;
    my @ini = ( );
    # first, try to read file
    $0 =~ m/^(.*)$/;
    $service = $1 . $service;
    if ( open( INI, "$service.ini" ) ) {
        @ini = ( < INI );
        return @ini unless ( $DB_SRV );
        # update datatable
        my $file_time = time - int ( ( -M "$service.ini" )
* 24 *
3600 );
#
print "time $file_time\n";
my $dbh = new Sybase: :CTlib $DB_USR, $DB_PWD,
$DB_SRV;
unless ( $dbh ) {
    print STDERR "webget.pl: Cannot connect to
dataserver $DB_SRV:$DB_USR:$DB_PWD\n";
    return @ini;
}
my @row_refs = $dbh->ct_sql ( "select lastUpdate
from
mcServices where service = '$service' ", undef, 1 );
if ( $dbh->{ RC } == CS_FAIL ) {
    print STDERR "webget.pl: DB select from
mcServices
failed\n";
    return @ini;
}
unless ( defined @row_refs ) {
    # have to insert
    my ( @ini_escaped ) = map {
        ( my $x = $_ ) =~ s/\'/\'\'/g;
        $x;
    } @ini;
    $dbh-> ct_sql ( "insert mcServices values (
'$service',
'@ini_escaped', $file time; )" );
    if ( $dbh->{ RC } == CS_FAIL )
        print STDERR "webget.pl: DB insert to
mcServices
failed\n";
    }
    return @ini;
}

```

TABLE 3-continued

```

#
print "time $file_time:"$row_refs [ 0 ] -> {
'lastUpdate'
}."n";
5
} ) {
    # have to update
    my ( @ini_escaped = map {
        ( my $x = $_ ) =~ s/\'/\'\'/g;
        $x;
    } @ini;
    $dbh-> ct_sql ( "update mcServices set config
=
'@ini_escaped', lastUpdate = $file_time where service =
'$service' " );
    if ( $dbh->{ RC } - CS_FAIL ) {
        print STDERR "webget.pl: DB update to
mcServices
failed\n";
    }
    return @ini;
}
else {
    print STDERR "$0: WARNING: $service.ini n/a in "
    . 'pwd'
    . "Try to read DB\n";
}
# then try to read datatable
die "webget.pl: Unable to find service $service\n"
unless ( $DB_SRV
) ;
my $dbh = new Sybase: :CTlib $DB_USR, $DB_PWD,
$DB_SRV;
die "webget.pl: Cannot connect to dataserver
$DB_SRV: $08 USR: $08 PWD\n" unless ( $dbh );
my @row_refs = $dbh->ct_sql ( "select con.fid from
mcServices where
service = '$service' ", undef, 1 );
die "webget.pl: DB select from mcServices failed\n" if
$dbh->{ RC }
= CS_FAIL;
35
die "webget.pl: Unable to find service $service\n"
unless ( defined
@row_refs );
$row_refs [ 0 ] -> { 'config' } =~ s/\n /\n\r/g;
@ini = split ( /\r/, $row_refs [ 0 ] ->{ ' config' } );
return @ini;
#####
40
sub process_section {
    my ( $prev_section ) = @_;
    my ( $section, $output, $content );
    my %Param;
    my %Content;
#
print "#####\n";
45
foreach ( @ini ) {
    print;
    chop;
    s/s+$/;
    s/^\[(.*)\] / {
        # get section name
        if ( /\[(.*)\] / ) {
            print "$_: $section:$prev_section\n";
            last if $section;
            next if $1 eq "print";
            #
            next if $prev_section ne "" and
            $prev_section ne $1;
55
            if ( $prev_section eq $1 )
                $prev_section = "";
            next;
            $section = $1;
        }
        # get parameters
        Push ( @ { $Param{ $1 } }, $2 ) if $section and
        / ( [ ^ = ] + ) = (.*) /;
#
print "+++++\n";
return 0 unless $section;
#
print "section $section\n";
# substitute parameters with values
65
map { $Param{ URL }->[ 0 ] =~ s/$Param{ Input }->[ $

```

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TABLE 3-continued

```

] /$ARGV [ $__
]/g
} 0..$# { $Param{ Input } };
# get page content
( $Content={ 'TIME' }, $content ) = get_url_content (
$ { $ Param { URL
} } [ 0 ] );
# filter it
map {
  if (/^([^\s]+)\s*$/) {
    /([^\s]+)/([^\s]*)/
  }
  my $out = $2; $content =~ s/$1/$out/g;
}
} @ { $Param{ "Pre-filter" } };
#print STDERR $content;
# do main regular expression
unless ( @values = $content =~ / $! Param {
Regular expression } } [ 0
] ) {
  __hard ( $ { $Param(Regular_expression) } } [ 0
], $content
);
  return $section;
}
%Content = map { ( $Param{ Output }->[ $__ ], $values [
$__ ] )
} 0..$# ( $Param { Output } );
# filter it
map {
  if ( / ( ( [^\s]+) \s* ( [^\s]+ ) \s* ( [^\s]+ ) \s*
or / ( [^\s]+ ) \s* ( [^\s]+ ) \s* ( [^\s]+ ) \s* ) (
my $out = $3;
$content{ $1 } =~ s/$2/$out/g;
}
} @ { $Param { "Post-filter" } };
#calculate it
map
# calculate it
map {
  if ( / ( [^\s]+ ) \s* ( [^\s]+ ) \s* ( [^\s]+ ) \s* ) {
    my $seval = $2;
    map { $seval =~ s/$1/$content{ $__ }/g
    } keys %Content;
    $content{ $1 } = eval( $seval );
  }
} @ { ( $Param{ Calculate } } );
# read section [print]
foreach $i ( 0 .. $#ini ) {
  next unless $ini [ $i ] /\[print\]/;
  foreach ( $i + 1 .. $#ini ) {
    last if $ini [ $__ ] =~ /\[.+\]/;
    $output .= $ini [ $i ] . "\n";
  }
  last;
}
# prepare output
map { $output =~ s/$1/$content{ $__ }/g
} keys %Content;
print $output;
return 0;
}
#####
sub get_url_content {
  my ( $url ) = @_;
  print STDERR $url if $debug;
  $response = $.url.pl 'Surl' ;
  $response = $.url.pl 'Surl' ;
  Return( $time - time, $response );
  my $ua = LWP: :UserAgent -> new;
  $ua -> agent ( 'Mozilla/4.0 [en] (X11; I; FreeBSD 2.2.8-
STABLE i386)'
);
# $ua -> proxy( [ 'http', 'https' ],
'http://proxy.webley:3128/' );
# $ua -> no_proxy ( 'webley', 'vail' );
my $cookie = HTTP: :Cookies -> new;
$ua -> cookie_jar ( $cookie );
$url = url $url;
print "Surl\n" if $debug2;

```

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TABLE 3-continued

```

my $time = time;
my $res = $ua -> request ( GET $url );
print "Response: " . ( time - $time ) . "sec\n" if
5 $debug2;
Return ( $time - time, $res -> content );
}
#####
sub die hard {
  my ( $re, $content ) = @_;
  - my ( $re_end, $pattern );
10 while( $content ! ~ /$re/ ) {
    if ( $re =~ s/ ( ( [^\s]+ ) \s* ( [^\s]+ ) \s* ) / / ) {
      $re_end = $1 . $re_end;
    }
    else {
      $re_end = $re;
      last;
    }
  }
  $content =~ /$re/;
  $re/n
Possible misuse:
20 $re_end: \n
Matched:
$&\n
Mismatched:
$'\n
" if $debug;
25 if ( $debug ) {
  print STDERR "Content:\n $content\n" unless
  $';
}
}
#####
30

```

Once the web browsing server **302** accesses the web site specified in the CRL **404** and retrieves the requested information, it is forwarded to the media server **304**. The media server uses the speech synthesis engine **502** to create an audio message that is then transmitted to the user's voice enabled device **306**. In the preferred embodiment, each web browsing server is based upon Intel's Dual Pentium III 730 MHz microprocessor system.

Referring to FIG. 3, the operation of the personal voice-based information retrieval system will be described. A user establishes a connection between his voice enabled device **306** and a media server **304** of the voice browsing system **108**. This may be done using the Public Switched Telephone Network (PSTN) **308** by calling a telephone number associated with the voice browsing system **108**. Once the connection is established, the media server **304** initiates an interactive voice response (IVR) application. The IVR application plays audio message to the user presenting a list of 10 options, which includes "perform a user-defined search." The user selects the option to perform a user-defined search by speaking the name of the option into the voice enabled device **306**.

The media server **304** then accesses the database **300** and retrieves the personal recognition grammars **402**. Using the speech synthesis engine **502**, the media server **304** then asks the user, "Which of the following user-defined searches would you like to perform" and reads to the user the identification name, provided by the recognition grammar **402**, of each user-defined search. The user selects the desired search by speaking the appropriate speech command or pronounceable name described within the recognition grammar **402**. These speech recognition grammars **402** define the speech commands or pronounceable names spoken by a user in order to perform a user-defined search. If the user has a multitude of user-defined searches, he may speak the command or pronounceable name described in the recognition

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grammar 402 associated with the desired search at anytime without waiting for the media server 304 to list all available user-defined searches. This feature is commonly referred to as a "barge-in" feature. The media server 304 uses the speech recognition engine 500 to interpret the speech commands received from the user. Based upon these commands, the media server 304 retrieves the appropriate user-defined web site record 400 from the database 300. This record is then transmitted to a web browsing server 302. A firewall 310 may be provided that separates the web browsing server 302 from the database 300 and media server 304. The firewall provides protection to the media server and database by preventing unauthorized access in the event the firewall 312 for the web browsing server fails or is compromised. Any type of firewall protection technique commonly known to one skilled in the art could be used, including packet filter, proxy server, application gateway, or circuit-level gateway techniques.

The web browsing server 302 accesses the web site 106 specified by the URL 404 in the user-defined web site record 400 and retrieves the user-defined information from that site using the content extraction agent and specified content descriptor file specified in the content extraction agent command 406. Since the web browsing server 302 uses the URL and retrieves new information from the Internet each time a request is made, the requested information is always updated.

The content information received from the responding web site 106 is then processed by the web browsing server 302 according to the associated content descriptor file. This processed response is then transmitted to the media server 304 for conversion into audio messages using either the speech synthesis engine 502 or selecting among a database of prerecorded voice responses contained within the database 300.

It should be noted that the web sites accessible by the personal information retrieval system and voice browser of the preferred embodiment may use any type of mark-up language, including Extensible Markup Language (XML), Wireless Markup Language (WML), Handheld Device Markup Language (HDML), Hyper Text Markup Language (HTML), or any variation of these languages.

The descriptions of the preferred embodiments described above are set forth for illustrative purposes and are not intended to limit the present invention in any manner. Equivalent approaches are intended to be included within the scope of the present invention. While the present invention has been described with reference to the particular embodiments illustrated, those skilled in the art will recognize that many changes and variations may be made thereto without departing from the spirit and scope of the present invention. These embodiments and obvious variations thereof are contemplated as falling within the scope and spirit of the claimed invention.

The invention claimed is:

1. A method for retrieving information from an information source, the information source being periodically updated with current information, over a network, by speech commands received from a particular user of a plurality of users provided by the particular user via an electronic-communication device, and wherein each of the plurality of users has a respective electronic-communication device, said method comprising:

(a) receiving a speech command from each of the plurality of users provided via the respective electronic-communication device, by a speech-recognition engine coupled to a media server, the media server configured

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to identify and access the information source via the network, the speech-recognition engine adapted to select speech-recognition grammar established to correspond to the speech commands received from the plurality of users and assigned to a desired search;

(b) selecting, by the media server, at least one information-source-retrieval instruction corresponding to the speech-recognition grammar established for a particular speech command, the at least one information-source-retrieval instruction stored in a database associated with the media server and adapted to retrieve information;

(c) accessing, by a web-browsing server, a portion of the information source to retrieve information of interest requested by the particular user, by using a processor of the web-browsing server, which processor (i) performs an instruction that requests information from an identified webpage, and (ii) utilizes a content extractor within the web-browsing server to separate a portion of the information from other information, the information derived from only a portion of the webpage containing information of interest to the particular user, wherein the content extractor uses a content-descriptor file containing a description of the portion of information and wherein the content-descriptor file indicates a location of the portion of the information within the information source;

(d) selecting by the web-browsing server the information of interest from the information source and retrieving only the portion of the information of interest requested by the particular user according to the at least one information-source-retrieval instruction;

(e) converting the information retrieved from the information source into an audio message by a speech-synthesis engine, the speech-synthesis engine coupled to the media server; and

(f) transmitting the audio message to the electronic-communication device of the particular user requesting information of interest to the particular user.

2. The method of claim 1, further comprising: searching, by the media server, an associated website to locate requested information.

3. The method of claim 1, wherein the respective electronic-communication device is at least one of a landline telephone, a wireless telephone, and an internet protocol telephone and the media server is operatively connected to at least one of a local-area network, a wide-area network, and the internet.

4. The method of claim 1, wherein the media server functions as a user-interface system adapted to provide access to a voice-browsing system.

5. The method of claim 1, further comprising:

clipping engine adapted to initially generate the content-descriptor file that indicates the location of the portion of the information within the information source.

6. A system for retrieving information from an information source, the information source being periodically updated with current information, over a network, by speech commands received from a particular user of a plurality of users provided by the particular user via an electronic-communication device, and wherein each of the plurality of users has a respective electronic-communication device, said system comprising:

(a) a speech-recognition engine including a processor and coupled to a media server, the speech-recognition engine adapted to receive a speech command from each of the plurality of users provided via the respective

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electronic-communication device, the media server configured to identify and access the information source via the network, the speech-recognition engine adapted to select speech-recognition grammar established to correspond to the speech commands received from the plurality of users and assigned to a desired search;

(b) the media server further configured to select at least one information-source-retrieval instruction corresponding to the speech-recognition grammar established for a particular speech command, the at least one appropriate information-source-retrieval instruction stored in a database associated with the media server and adapted to retrieve information;

(c) a web-browsing server coupled to the media server and adapted to access a portion of the information source to retrieve information of interest requested by the particular user, by using a processor of the web-browsing server, which processor (i) performs an instruction that requests information from an identified webpage, and (ii) utilizes a content extractor within the web-browsing server to separate a portion of the information from other information, the information derived from only a portion of a webpage containing information of interest to a particular user, wherein the content extractor uses a content-descriptor file containing a description of the portion of information and wherein the content-descriptor file indicates a location of the portion of the information within the information source, and selecting, by the web-browsing server, the information of interest from the information source and retrieving only the portion of the information of interest requested by the particular user according to the at least one information-source-retrieval instruction; and

(d) a speech-synthesis engine including a processor and coupled to the media server, the speech-synthesis engine adapted to convert the information retrieved from the information source into an audio message and transmit the audio message by the electronic-communication device of the particular user requesting information of interest to the particular user.

7. The system claim 6, further comprising:
an interface to an associated website by the network to locate requested information.

8. The system of claim 6, wherein the respective electronic-communication device is at least one of a landline telephone, a wireless telephone, and an internet protocol telephone and wherein the media server is operatively connected to the network, which is at least one of a local-area network, a wide-area network, and the internet.

9. The system of claim 6, wherein the media server functions as a user-interface system adapted to provide access to a voice-browsing system.

10. The method of claim 6, further comprising:
clipping engine adapted to generate the content-descriptor file, by which, an instruction is used by the web-browsing server to request information from the identified website and the information is displayed on the respective electronic-communication device, wherein the information is only the portion of the webpage containing information of interest to the particular user.

11. A method for retrieving desired information from an information source of a plurality of information sources, the information source being periodically updated with current information, over a network, by speech commands received from a particular user of a plurality of users, wherein each

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of the plurality of users has a respective electronic-communication device, said method comprising:

(a) receiving a speech command, from each of the plurality of users via the respective electronic-communication device, the speech-recognition engine coupled to a media server, the media server configured to identify and access an information source from the plurality of information sources via the network, the speech-recognition engine adapted to select speech-recognition grammar established to correspond to the speech commands received, from certain of the plurality of users and assigned to a desired search;

(b) selecting, by the media server, at least one information-source-retrieval instruction corresponding to the speech-recognition grammar established for a particular speech command, the at least one information-source-retrieval instruction stored in a database associated with the media server and adapted to retrieve information;

(c) providing access, by the speech command, via a web-browsing server, to a portion of the information source to retrieve the desired information for the particular user, by using a processor of the web-browsing server, which processor (i) performs an instruction that requests information from an identified webpage, and (ii) utilizes a content extractor within the web-browsing server to separate a portion of the information from other information, the information is derived from only a portion of the webpage containing information of interest to a particular user, wherein the content extractor uses a content-descriptor file containing a description of the portion of information and wherein the content-descriptor file indicates a location of the portion of the information within the information source, (d) selecting, by the web-browsing server, the desired information from the appropriate information source and retrieving only the portion of the information of interest requested by the particular user according to the at least one information-source-retrieval instruction;

(e) converting the information retrieved from the information source into an audio message, by a speech-synthesis engine, the speech-synthesis engine coupled to the media server;

(f) conveying the audio message through the electronic-communication device to the respective electronic-communication device of the particular user requesting the desired information; and

(g) providing a graphical display and adapted to display the desired information retrieved from the information source to the particular user on the respective electronic-communication device of the particular user.

12. The method of claim 11, further comprising:
an interface to a plurality of associated websites accessed by the network to locate the desired information.

13. The method of claim 11, wherein the respective electronic-communication device is at least one of a landline telephone, a wireless telephone, and an internet protocol telephone and wherein the media server is operatively connected to the network, which is at least one of a local-area network, a wide-area network, and the internet.

14. The method of claim 11, wherein the web-browsing server further comprises the content-descriptor file, which is stored within the web-browsing server, wherein the content-descriptor file relates to obtaining the desired information from a website.

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15. The method of claim 11, wherein the speech command includes a phrase provided by the certain users, the phrase associated with an identified website and information.

16. The method of claim 11, wherein a command for executing a content-extraction agent are stored in a database associated with the media server and used for voice browsing.

17. The method of claim 11, wherein the media server functions as a user-interface system adapted to provide access to a voice-browsing system.

18. The method of claim 11, further comprising:

clipping engine coupled to the content-descriptor file, by which, the instruction requests information from the identified website and the information is displayed on the respective electronic-communication device, wherein the information is only the portion of the webpage containing information of interest to the particular user.

19. An information-retrieval system for retrieving information from an information source, the information source being periodically updated with current information, comprising:

(a) a speech-recognition engine coupled to a processor and a media server and adapted to receive a speech command from a particular user of a plurality of users via an electronic-communication device to access desired information, wherein each of the plurality of users has a respective electronic-communication device, the media server configured to identify and access an information source from a plurality of information sources via the network, the speech-recognition engine adapted to select speech-recognition grammar established to correspond to the speech commands received, the speech-recognition grammar associated with the desired information;

(b) the media server, adapted to select at least one information-source-retrieval instruction corresponding to the speech-recognition grammar established for a particular speech command, the at least one information-source-retrieval instruction stored in a database associated with the media server and adapted to retrieve information from a particular one of the information sources that has the desired information;

(c) a web-browsing server, adapted to provide access, by the speech command, to a portion of the information source to retrieve the desired information, by using a processor of the web-browsing server, which process (i) performs an instruction that requests information from an identified webpage, and (ii) utilizes a content extractor within the web-browsing server to separate a

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portion of the information from other information, the information derived from only a portion of the webpage containing information of interest to the particular user, wherein the content extractor uses a content-descriptor file containing a description of the portion of information and wherein the content-descriptor file indicates a location of the portion of the information within the information source and selecting, by the web-browsing server, the desired information from the information source and retrieving only the portion of the information desired by the particular user according to the at least one information-source-retrieval instruction;

(d) a speech-synthesis engine coupled to the media server, and adapted to convert the portion of the information from the information source into an audio message for the particular user of the plurality of users and conveying the audio message through the electronic-communication device to the particular user of the plurality of users; and

(e) a graphical display interface coupled to the media server and adapted to provide for display the desired information retrieved from the information source to certain others of the plurality of users.

20. The system claim 19, further comprising:

an interface to a plurality of associated websites of the information source accessed by the network to locate the desired information.

21. The system of claim 19, wherein the respective electronic-communication device is at least one of a landline telephone, a wireless telephone, and an internet protocol telephone.

22. The system of claim 19, wherein the media server is operatively connected to the network, which is at least one of a local-area network, a wide area network, and the internet.

23. The system of claim 19, wherein the content-descriptor file relates to obtaining the desired information from a website.

24. The system of claim 19, wherein the speech command includes a phrase provided by the particular user, the phrase associated with an identified website and information available at the website.

25. The system of claim 16, wherein a command for executing the content-extraction agent is stored in a database associated with the media server and used for voice browsing.

26. The system of claim 19, further comprising: a database wherein a personal-recognition grammar is stored in the database and relates to web information.

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