A portable unit is for video communication to select a user name in a user name network. A transceiver wirelessly accesses a communication network through a wireless connection to a general purpose node coupled to the communication network. A user interface can receive user input to log on to a user name network through the communication network. The user name network has a plurality of user names, at least one of the plurality of user names is associated with a remote portable unit, logged on to the user name network and available for video communication.

29 Claims, 3 Drawing Sheets

References Cited

U.S. PATENT DOCUMENTS
5,202,756 A 4/1993 Sasaki et al.
5,305,244 A 4/1994 Newman et al.
5,386,233 A 1/1995 Keith
5,402,414 A 3/1995 Asai
5,495,576 A 2/1996 Ritchey
5,550,754 A 8/1996 McNelley et al.
5,557,320 A 9/1996 Krebs
5,570,367 A 10/1996 Ayanoglu et al.

Primary Examiner — Ricardo L. Osorio

ABSTRACT

A portable unit is for video communication to select a user name in a user name network. A transceiver wirelessly accesses a communication network through a wireless connection to a general purpose node coupled to the communication network. A user interface can receive user input to log on to a user name network through the communication network. The user name network has a plurality of user names, at least one of the plurality of user names is associated with a remote portable unit, logged on to the user name network and available for video communication.

29 Claims, 3 Drawing Sheets
### References Cited

**U.S. PATENT DOCUMENTS**

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,579,375 A</td>
<td>11/96</td>
<td>Ginter</td>
</tr>
<tr>
<td>5,664,006 A</td>
<td>9/97</td>
<td>Monte et al.</td>
</tr>
<tr>
<td>5,689,300 A</td>
<td>11/97</td>
<td>Shibata et al.</td>
</tr>
<tr>
<td>5,710,798 A</td>
<td>1/98</td>
<td>Campana, Jr.</td>
</tr>
<tr>
<td>5,749,052 A</td>
<td>5/98</td>
<td>Hidem et al.</td>
</tr>
<tr>
<td>5,759,044 A</td>
<td>6/98</td>
<td>Redmond</td>
</tr>
<tr>
<td>5,809,176 A</td>
<td>9/98</td>
<td>Yajima</td>
</tr>
<tr>
<td>5,815,080 A</td>
<td>9/98</td>
<td>Taguchi</td>
</tr>
<tr>
<td>5,844,601 A</td>
<td>12/98</td>
<td>McPheely et al.</td>
</tr>
<tr>
<td>5,844,824 A</td>
<td>12/98</td>
<td>Newman et al.</td>
</tr>
<tr>
<td>5,850,352 A</td>
<td>12/98</td>
<td>Moezzi et al.</td>
</tr>
<tr>
<td>5,864,681 A</td>
<td>1/99</td>
<td>Proctor et al.</td>
</tr>
<tr>
<td>5,926,624 A</td>
<td>7/99</td>
<td>Katz et al.</td>
</tr>
<tr>
<td>6,026,082 A</td>
<td>2/00</td>
<td>Astrin</td>
</tr>
<tr>
<td>6,035,349 A</td>
<td>3/00</td>
<td>Ha et al.</td>
</tr>
<tr>
<td>6,044,088 A</td>
<td>3/00</td>
<td>Rahman et al.</td>
</tr>
<tr>
<td>6,050,940 A</td>
<td>4/00</td>
<td>Braun et al.</td>
</tr>
<tr>
<td>6,058,164 A</td>
<td>5/00</td>
<td>Snelling et al.</td>
</tr>
<tr>
<td>6,105,060 A</td>
<td>8/00</td>
<td>Rothblatt</td>
</tr>
<tr>
<td>6,141,032 A</td>
<td>10/00</td>
<td>Priest</td>
</tr>
</tbody>
</table>

6,192,257 B1  2/2001 Ray
6,236,854 B1  5/2001 Bradshaw, Jr.
6,253,061 B1  6/2001 Helferich
6,297,852 B1  10/2001 Laksono et al.
6,298,370 B1  10/2001 Tang et al.
6,314,302 B1  11/2001 Haferbeck et al.
6,317,039 B1  11/2001 Thomason
6,327,579 B1  12/2001 Stevens
6,356,945 B1  3/2002 Shaw et al.
6,384,846 B1  5/2002 Hiroi
6,385,593 B2  5/2002 Linberg
6,392,692 B1  5/2002 Monroe
6,404,928 B1  6/2002 Shaw et al.
6,438,384 B1  8/2002 Chen
6,487,663 B1  11/2002 Jaisimha et al.
6,522,352 B1  2/2003 Strandwitz et al.
6,526,538 B1  2/2003 Hewitt
6,600,734 B1  7/2003 Gernert et al.
6,810,035 B1  10/2004 Knautila et al.

* cited by examiner
Welcome to WARPR
Users logged on:
- Vest
- Gordon
- VC1
- GreatHac
- Remote: DHike
- Nameserver
  select one
User puts on the portable access unit with headset and sensor

User logs in and portable access unit associates with local general purpose node

Provide connection list to portable access unit from general purpose nodes

Present connection list of portable access units and media devices logged onto the system

Select entry from the selection list

 Transmit selection to the general purpose node

Set connection between user's portable access unit and the Selected portable access unit or media device through the general purpose node

Exchange signals

FIG. 3
WIRELESS AUGMENTED REALITY COMMUNICATION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of priority as a continuation under 35 U.S.C. 120 of U.S. patent application Ser. No. 14/038,760, filed on Sep. 27, 2013, which is continuation of U.S. patent application Ser. No. 13/723,472 (now U.S. Pat. No. 8,633,869), filed on Dec. 21, 2012, which is a continuation of U.S. patent application Ser. No. 12/698,107 (now abandoned), filed on Feb. 1, 2010, which is a continuation of U.S. patent application Ser. No. 11/410,517 filed on Apr. 24, 2006 (now abandoned), which is a continuation of U.S. patent application Ser. No. 09/483,315 filed on Jan. 14, 2000 (now U.S. Pat. No. 7,035,897), which claims priority from U.S. Provisional Application No. 60/115,993 filed on Jan. 15, 1999, the contents of each being herein incorporated by reference in their entirety.

GOVERNMENT LICENSE RIGHTS

The U.S. Government has certain rights in this invention pursuant to NAS7-1407 awarded by NASA.

FIELD OF THE INVENTION

The invention, in general, relates to a wireless augmented reality system (WARS), and more particularly, to a WARS that leverages communications and multimedia information processing microelectronics, along with displays, imaging sensors, biosensors, and voice recognition to provide hands-free, tetherless, real-time access and display of network resources, including video, audio and data.

DESCRIPTION OF THE PRIOR ART AND RELATED INFORMATION

Online instruction manuals are becoming more prevalent in the industrial and everyday environment. These electronic technical manuals (ETM) may be interactive. Just as with printed manuals, ETMs may become very difficult to use and maintain in these environments where elements of an environment, such as dust, chemical or general harshness may be detrimental to the electronics and storage devices used to display and operate the ETM. Further, it is not always possible for a worker who requires access to an ETM to stop work to consult ETM.

These problems are multiplied in extraterrestrial environments such as a space shuttle or a space station. During intra and extra vehicular activities, it may be very difficult to access a traditional keyboard and computer display to access an ETM. For example, during a satellite repair mission, it would not be practical for an astronaut in a bulky extravehicular space suit to type commands on a keyboard to view a display in the extreme environment of outer space where the sun glare may make viewing impossible.

Hands-free portable computers have been implemented in an attempt to solve some of these problems. For example, U.S. Pat. Nos. 5,305,244 and 5,844,824 describe systems in which a head-up display and a voice recognition is implemented in a portable computer for displaying ETM. However, these systems, being a single user-to-computer paradigm, do not allow multiple-user access to multiple computers, multimedia devices or nodes on a network for accessing arbitrarily-selected data channels. Further, these previously-described systems are self-contained and their data storage needs to be updated periodically to be sure that the latest data is displayed. Further, these systems do not allow two-way communication over local and wide area networks to other multimedia users and devices, and do not provide real-time biomedical information about the physical condition of the user.

There is thus a need for a wireless, wearable communication system allowing two-way voice, video and data communication between local users and to remote users and devices over network nodes, along with tetherless real-time monitoring of the local user's physical condition.

SUMMARY

The needs of the prior art are met by a portable unit, methods of software for video communication to select a user name in a user name network.

In one embodiment, a transceiver wirelessly accesses a communication network through a wireless connection to a general purpose node coupled to the communication network. A user interface can receive user input to log on to a user name network through the communication network. The user name network has a plurality of user names, at least one of the plurality of user names being associated with a remote portable unit, logged on to the user name network and available for video communication. In some embodiments, the user interface comprises a touchpad configured to receive user inputs. A display on the portable unit displays one or more of the plurality of user names.

In an embodiment, the user interface further receives a selection of a user name from the plurality of user names. The display displays video communication received by the portable unit from the remote portable unit. The video communication is associated with the selected user name.

With reference to FIG. 1, a diagram illustrating the components of the system of the present invention is shown. The system may comprise small pager-like devices called portable access units 100. The portable access units 100 are accessorizable for different "multimedia" interfaces for display, camera, audio and sensor operation. Another embodiment of the portable access unit 100 comprises a wearable headset and microphone assembly 102a.

The portable access units 100-100a interface directly through wireless link with a network through a general purpose node 150. The general purpose node 150 allows wireless-to-wire communication with a local network 170. The local area network 170 may be electrically connected to a wide area network or Internet in order to connect to remote local area networks. Alternatively, the general purpose node 150 may be directly connected to the wide area network 172. The general purpose node 150 may thus act as a router for routing video, display, audio and control data pack-
ports between the portable access units 100 and other, or remote, portable access units 100 or remote media devices 125, 180, etc connected to the networks 170-174. The connection with a network 170-174 may occur directly in electrical connection with one of the networks 170-174, or in wireless communication through a remote general purpose node 150a that is electrically connected to the network. The portable access units 100 may provide communication to and from remote media devices comprising computers 180-182 running specialized client software or certain commercial multimedia Internet software products such as video conferencing products that adhere to the industry standard H.323 for multimedia data transfer.

Each portable access unit 100-100a may dynamically associate with the closest general purpose node 150-150a when it is logged on to the network 170-174 or is connected thereto. Each general purpose node 150-150a records the associations and registers each portable access unit 100-100a on a list of connections associated with the particular general purpose node 150-150a. The list of connections is stored in a random access memory device included in the general purpose node 150-150a. When a portable access unit 100 is logged off or disconnected from the network 170-174, it is disassociated from the particular general purpose node 150-150a that it was associated with, and, thus, is removed from the list of connections.

As shown on an example selection list screen 190 that may be presented on a display 102 or headset 102a on any of the portable access units 100-100a, the user can select a digital data stream which is fed to the communications device 202 of the general purpose node 150, an internal network interface protocol circuit 152, the external networks 170-174 and the electrical connection or general purpose access node connection to the desired remote portable access node or media device. The internal network interface protocol circuit 152 may comprise an Ethernet chip, memory and a network protocol chip. With this architecture, the system addresses the issues of multiple-access and data channel quality, through the implementation of the communications device 202. Multiple implementations of the communications device 202 in the general purpose node 150 allows for multiple simultaneous communication links with a plurality of portable access units 100-100a for the general purpose node 150.

With the base functionality of the communications device 202 and codec subsystem 200, the architecture provides flexibility in utilization of different external components such as different headset 102a configurations, sensor 104 packages, and network interface 152 capabilities.

Each portable access unit 100-100a may be part of a communications device 202 designed to operate in a high multipath space station or terrestrial indoor environment while being able to support multiple users at high, multimedia-type bandwidths. Thus the communications device's 202 physical (PHY) and media access (MAC) layers in combination support multiple access, dynamic network association, channel error rates of broadcast video quality (1 times 10e-6), and data rates up to broadcast-quality video bandwidths (on the order of 768 kbps per user (one-way)). Modulation to achieve this performance will be differential phase-shift keying, of binary or higher order (quadrature or higher-order quadrature amplitude modulation); the order chosen reflects the necessary data volume to be supported within fixed, FCC-specified bandwidth allocations. Orthogonal frequency division multiplexing, code division multiple access, and frequency hopping/time division multiple access may be used for achieving multiple access. Spread spectrum, channel equalization, antenna diversity and retransmission techniques may also be used for improving the reliability of the communications link. Through a combination of these technologies, two-way multimedia channel throughputs can be achieved for each of multiple simultaneous users. A variety of RF frequencies may be used, but the determining factor in frequency band selection is the availability in the band of a relatively large amount of spectrum in the space station or FCC terrestrial allocations, allowing the transmission of compressed video. Ranges in the 2.5 to 5.7 band range are preferable due to the FCC bandwidth available, the compactness of RF elements required at these frequencies, and the potentially low amount of interference that will be sustained. The RF front end of both the portable access unit 100-100a and general purpose node 150-150a may be interchangeable with different frequency front ends for system use in different frequency bands.

Low-rate, single user implementations of the communications system may be effected through adapted commercial wireless-LAN type products following the FCC 802.11 standard such as a frequency-hopping 2.4 GHz wireless LAN transceiver by Waveaccess, Inc of Wellesley, Mass., or direct-sequence spread-spectrum 2.4 GHz wireless LAN chipset by Harris Prism of Melbourne, Fla. These radio implementations, as with commercial implementations of the industry-proposed Bluetooth and HomeRF standards, will be limited in user access and overall throughput, however, and therefore unsuitable to real-time video teleconferencing for multiple users. The preferred embodiment for full capability is to implement the communications devices' physical and media
access control layers in custom ASIC circuits allowing for support of all system capabilities within microelectronics architecture for small size and low power draw, providing pager-type form factor of wearable personal access units 100-100a.

The communications device 202 comprises a buffer memory and a radio frequency front end. Data modulation/demodulation circuits and error detection/correction protocols are further included. Various combinations of these circuits may be obtained from Proxim of Sunnyvale, Calif., Harris of Melbourne, Fla. and Stanford Telecom of Stanford, Calif. Alternatively, all of the various circuits may be implemented with an application specific integrated circuit (ASIC), or a combination of an ASIC and discrete elements for size and weight efficiency.

Three classes of headsets 102a may be used: hi-resolution military systems which are CRT based and may be provided by Honeywell of Morristown, N.J., Hughes Network Systems of San Diego, Calif.; medium resolution industrial systems which are CRT or LED based scanners and may be provided by Intervision of Santa Clara, Calif.; or low to medium resolution entertainment systems which are color viewfinder LCD based systems that may be supplied by Virtual Vision of Redmond, Wash. (the V-CAP and E-GLASS), Sony Europe of Hampshire, United Kingdom (GLASTRON VISOR) or Olympus of San Jose, Calif. Typical headset display 120 specifications for the portable access unit 100a include the following:

RESOLUTION: Comparable at least to VGA (640x480) or better to 1280x1024 w/off-the-shelf display & I/O configuration
DISPLAY: >10 FL/day, Display Bright. Ratio: >2, Brightness range: 2 OOM
FOV: 40-60 deg, Gray scale: >12
EyeRelief: 20-26 mm TSP, 14/10 mm (on/off-axis) exit pupil
Unif: 2:1 across 2/3 FOV, GLARE: <2.5% image content, PixelContrast: 25
FOCUS: Hands off, Obs: % look-around, Diopter range: +/−2,
Mag: 1±p5%, Cont: >95%, motion sensor 10° cone, Inter. Eye.
 adj: 52-72 mm
Image Enhans & IFF: Weaponsight, motion sensor and computer interface

The audio/video codec 200 in a portable access unit 100-100a or other client device is based around a single chip, standards-based codec that accepts analog or digital audio and video (i.e. NTSC or VGA) compresses this input, and multiplexes the compressed data with an external data stream. The preferred industry standards are: ITU 11263 based video, ITU G.722 based audio, and ITU H.221 based multiplexing. Exemplary multimedia processors include the VCPEX chip by 8.times.8, Inc. of Santa Clara, Calif. or digital signal processing chips by Texas Instruments and others. The audio/video codec 200 further comprises a field processor gate array, electrically programmable readonly memory and random access memory for processing and packaging signals for compression and decompression.

The sensor 104 may comprise a commercially available pulse oximeter sensor or other type of bio-sensor. A pulseoximeter sensor allows the measurement of pulse rate and oxygen saturation of the blood. Data from the sensor 104 is transmitted to the general purpose node 150-150a, and transmitted to any remote media device connected to any of the networks 170-172. The sensor 104 may comprise an “on body” wireless human performance and fatigue monitoring system that communicates with a belt-mounted transceiver/ control module. The remote media device may comprise a processor 180-182 for display or logging of the real-time sensor signals.

The headset 102a comprises a heads-up display 120 comprising a transparent color LCD device for video signals received and processed by the codec 200. The headset 102a may further comprise, or have attached thereto, an integrated microphone 122 for receiving voice commands from the user of the portable access unit 100a or for communicating voice signals to a remote portable access unit 100 or remote media device. The headset may further comprise a speaker 124 or earpiece unit for presenting audio signals to the user. The portable access unit 100a may further comprise a digital camera 106 that may either be attached on the user’s person, or to the headset 102a for providing video signals to other portable access units 100-100a or media devices.

With reference to FIG. 3, a flow diagram illustrating the method performed by the system of FIG. 1 is shown. A user puts on the headset 102a, portable access unit 100a, step 400. The user may log into the local general purpose node 150 wherein the portable access unit associates with the general purpose node 150 such that the user is added to a connection list stored in a random access memory device residing in the general purpose node 150, step 401. Data is provided from the general purpose node 150 to the portable access unit through the communication devices 202, step 402. The user is presented with a selection list 190 of portable access units 100-100a and media devices logged onto the system on the display 120, step 404. The user selects one of the entries from the selection list, step 406. The selection is transmitted to the general purpose node 150, step 408. The general purpose node 150 sets up a connection over the networks 170-174 for channeling data between the portable access unit 100a and the selected network device, step 410. The selected network device may comprise the processor 180 or another network client 182 for running a software application. A camera 125 for providing remote viewing operations to the user on the display 120, the Internet phone 104 for providing voice communications with the remote user, or another portable access unit 100-100a over a remote general purpose node 150a. By providing control commands to the microphone 122 or other input system, such as a keyboard or handheld mouse, the user may conduct operations by transmitting commands between

presssed video. The quality of the video at these data rates in excess of 128 kbps is at least equivalent to video teleconferencing quality video.
the portable access unit 100a and the general purpose node
150 which routes the control commands to the device that the user selected, step 412.

It will thus be seen that changes may be made in carrying out the above system and method and in the construction set forth without departing from the spirit and scope of the invention, it is intended that any and all matters contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A portable unit for video communication to select a user name in a user name network, the portable unit comprising:
a transceiver for wirelessly accessing a communication network through a wireless connection to a general purpose node, the general purpose node coupled to the communication network;
a user interface to receive user input to log on to the user name network through the communication network, the user name network having a plurality of user names, wherein at least one of the plurality of user names is associated with a remote portable unit, logged on to the user name network and available for video communication, and wherein the user interface comprises a touchpad configured to receive user inputs; and
a display on the portable unit to display one or more of the plurality of user names, wherein the user interface further receives a selection of the user name from the plurality of user names, and wherein the display displays video communication received by the portable unit from the remote portable unit, the video communication associated with the selected user name.

2. The portable unit of claim 1, wherein the user interface receives user input to add a portable unit to a list of connections.

3. The portable unit of claim 2, wherein the user interface is configured to receive user input to remove a portable unit from the list of connections.

4. The portable unit of claim 1, wherein the video communication comprises two-way video communication.

5. The portable unit of claim 1, wherein at least one of the portable unit and the remote portable unit comprises an internet telephone.

6. The portable unit of claim 1, wherein at least one of the portable unit and the remote portable unit has pager-like dimensions.

7. The portable unit of claim 1, wherein the portable unit is configured to access a name server to locate additional remote media devices that are out-of-network.

8. The portable unit according to claim 1 further comprising:
a video input to receive real-time video information;
a video output to provide real-time video information to the display;
a codec coupled to the video input and the video output; and
wherein the transceiver comprises:
a transmitter coupled to the codec to transmit a data stream provided by the codec over the wireless connection; and
a receiver coupled to the codec to receive a data stream transmitted over the wireless connection.

9. The portable unit according to claim 8, wherein the codec encodes real-time video received from the video input, and multiplexes the real-time video encoded by the codec with other data to generate the data stream provided by the codec to the transmitter, and wherein the codec demultiplexes encoded real-time video from the data stream provided to the codec by the receiver, and decodes the encoded real-time video to provide decoded real-time video to the video output.

10. The portable unit according to claim 9, further comprising:
an audio input to receive real-time audio information; and
an audio output to provide real-time audio information, wherein the codec is in communication to the audio input and the audio output.

11. The portable unit according to claim 10, wherein the codec encodes real-time audio received from the audio input, multiplexes the real-time video encoded by the codec with at least the real-time audio encoded by the codec to generate the data stream that is provided to the transmitter.

12. The portable unit according to claim 11, wherein the codec demultiplexes encoded real-time video from the data stream provided by the receiver that also includes at least encoded real-time audio, and decodes the encoded real-time audio and provides the decoded real-time audio to the audio output.

13. The portable unit of claim 1, further comprising:
a personal biological sensor to generate real-time sensor signals associated with the user.

14. The portable unit of claim 1, wherein the portable unit is wearable.

15. A system for video communication to select a user name from a user name network, the system comprising:
a portable unit and a remote portable unit, wherein the portable unit comprises:
a first transceiver for wirelessly accessing a communications network through a first wireless connection to a general purpose node, the general purpose node coupled to the communications network;
a first user interface to receive user input to log on to the user name network through the communications network, wherein the first user interface comprises a touchpad configured to receive user inputs, and wherein the user name network has a plurality of user names;
a first display on the portable unit to display one or more of the plurality of user names; and
display to display video communication received by the portable unit from the remote portable unit, the video communication associated with the selected user name; and
wherein the remote portable unit comprises:
a second transceiver for wirelessly accessing the communications network through a second wireless connection to the general purpose node;
a second user interface to receive user input to log on to the user name network through the communications network, wherein the second user interface comprises a touchpad configured to receive user inputs; and
display on the remote portable unit to display one or more of the plurality of user names; and
said second display to display video communication received by the remote portable unit from the portable unit.

16. The system of claim 15, wherein the first display displays at least one of the plurality of user names that is associated with the remote portable unit, logged on to the user name network and available for the video communication.

17. The system of claim 15, wherein the first user interface is configured to receive user input to add a portable unit to a list of connections.
18. The system of claim 17, wherein the first user interface is configured to receive user input to remove a portable unit from the list of connections.

19. The system of claim 15, wherein the video communication comprises two-way video communication.

20. The system of claim 15, wherein at least one of the portable unit and the remote portable unit comprises an internet telephone.

21. The system of claim 15, wherein at least one of the portable unit and the remote portable unit has pager-like dimensions.

22. The system of claim 15, wherein the portable unit accesses a name server to locate additional remote media devices that are out-of-network.

23. The system of claim 15, wherein the portable unit further comprises:
   a video input to receive real-time video information;
   a video output to provide real-time video information to the first display;
   a codec coupled to the video input and the video output;
   and
   wherein the first transceiver comprises:
   a transmitter coupled to the codec to transmit a data stream provided by the codec over the first wireless connection;
   and
   a receiver coupled to the codec to receive a data stream transmitted over the first wireless connection.

24. The system according to claim 23, wherein the codec encodes real-time video received from the video input, and multiplexes the real-time video encoded by the codec with other data to generate the data stream provided by the codec to the transmitter.

25. The system according to claim 24, wherein the codec demultiplexes encoded real-time video from the data stream provided to the codec by the receiver, and decodes the encoded real-time video to provide decoded real-time video to the video output.

26. The portable unit according to claim 24, wherein the codec encodes real-time audio received from the audio input, multiplexes the real-time video encoded by the codec with at least the real-time audio encoded by the codec to generate the data stream that is provided to the transmitter, and wherein the codec demultiplexes encoded real-time video from the data stream provided by the receiver that also includes at least encoded real-time audio, and decodes the encoded real-time audio and provides the decoded real-time audio to the audio output.

27. The system according to claim 23, further comprising:
   an audio input to receive real-time audio information;
   an audio output to provide real-time audio information, wherein the codec is in communication to the audio input and the audio output.

28. The portable unit of claim 15, further comprising:
   a personal biological sensor to generate real-time sensor signals associated with the user.

29. The portable unit of claim 15, wherein the portable unit is wearable.