The system of the present invention is a highly integrated radio communication system with a multimedia co-processor which allows true two-way multimedia (video, audio, data) access as well as real-time biomedical monitoring in a pager-sized portable access unit. The system is integrated in a network structure including one or more general purpose nodes for providing a wireless-to-wired interface. The network architecture allows video, audio and data (including biomedical data) streams to be connected directly to external users and devices. The portable access units may also be mated to various non-personal devices such as cameras or environmental sensors for providing a method for setting up wireless sensor nets from which reported data may be accessed through the portable access unit. The reported data may alternatively be automatically logged at a remote computer for access and viewing through a portable access unit, including the user's own.

41 Claims, 3 Drawing Sheets
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**Welcome to WARP**
Users logged on:
- Vest
- Gordon
- VC1
- GreatHac
- Remote: DrHike
- Nameserver
  select one

**FIG. 1**
FIG. 2

Codec Subsystem

Comm Device

100a
102a
120
124
106
200
202
104
150
152
170-174
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
1 WIRELESS AUGMENTED REALITY COMMUNICATION SYSTEM

GOVERNMENT LICENSE RIGHTS

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

RELATED APPLICATIONS

This application is based on provisional patent application Ser. No. 60/115,993 filed Jan. 15, 1999.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention is a wireless augmented reality system (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.

2. Description of the Prior Art and Related Information

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 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 multi-media 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 communications 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 OF THE INVENTION

The system solves the above problems with prior art systems with an adaptive wireless remote access network comprised of small individual portable access units linked to a local cellular general purpose node. Interlinked general purpose nodes support communications across different habitat modules or internal-to-external communications, in the case of the space environment; terrestrial wired networks such as the Internet can serve as the interconnection of remotely scattered access nodes in an industrial, commercial or home environment application.

The system may provide shuttle and international space station astronauts with tetherless, on-demand access to data channels from multimedia devices such as cameras or audio sensors associated with other persons or in a stand-alone configuration, and multimedia or data display from a networked computer terminal and to the equipment control capabilities which may be available through that computer. Transparent to such access, the system can maintain a data channel for monitoring an astronaut’s health or environment via in-situ sensors. Though this system may be used for the shuttle and the international space station, the system has uses in many possible applications related to medical, industrial, and commercial areas.

The invention is a personal communications system designed especially for the space shuttle or station environment to provide cellular communications access throughout the vessel with video, audio, data and computer connect services. A small, wearable portable access unit (PAU) communicates over high-rate link to a centrally-located network access unit, called a general purpose node herein. The system backbone provides 2-way video, 2-way audio, and a multi-purpose data channel between the PAU and general purpose node. One embodiment of the PAU used for personal communication has an attached headset with video display, audio feed and camera, which together may be used for audio or video teleconferencing. When used as a virtual terminal to a computer in the network, the user is able to view and manipulate imagery, text or video, using voice commands to control the terminal operations.

Using the system, an astronaut may efficiently operate and monitor computer-controllable activities inside or outside the vehicle or station. Hands-free access to computer-based instruction texts, diagrams and checklists replaces juggling manuals and clipboards, and tetherless computer system access allows free motion throughout a habitat while monitoring and operating equipment. Along with voice commands, an integrated “touchpad” on the PAU may be used for remote computer control through a sensor data channel; this return data channel may also be used for other control data as from a three-D mouse or data glove input device, allowing the real-time video display to be used for remote, wireless monitor and control of robotic cameras or manipulators.

Concurrent with information provided to the astronaut, the system also allows external observation of the astronaut’s situation; personal biological or other sensors can send back continuous telemetry through personal access unit and general purpose node. A miniature camera integrated into the headset provides real-time video of the wearer’s field of view to remote observers. In this way, for example, a principal investigator located on Earth may consult with a payload specialist on the operation or troubleshooting of their equipment.

The system provides wireless high-rate data exchange. The radio link is adapted to operate within a high-interference, high-multipath environment of a space shuttle or space station module. Radio frequency (RF) links do not require visual line-of-sight to operate, but the metal walls and lack of RF absorbers, combined with moving human bodies,
creates an enormous potential for destructive self-interference of the radio signals. The integrated radio and multimedia data processing technology provides for efficient and high-quality video and audio data compression for noisy indoor communications channels. The system supports multiple-user access for video, audio, and sensor data services in the wireless coverage area. Potential applications of the system are in any environment where heads-up, hands-free information retrieval or multimedia communications access improves efficiency including tetherless operations/monitor consoles, remote consultations in medical or maintenance procedures, and hazardous/confined space activities. There are also in-the-home entertainment/communications applications.

Similar to the space extravehicular activities applications, bio-isolation suits have similar operation constraints to space suits. They are worn commonly where there are chemical or biological contaminants, and any extraneous materials brought into a chamber, such as clipboards or documents, also present a contamination risk. A unit suitably modified for use in a space suit could be used in this situation. This allows the user to use a computer (log data, use a check list, etc.), to communicate with colleagues, including providing first-hand video of work in progress, and to maintain constant monitoring of the health of the user.

An extension of the medical applications areas would be in remote telemedicine. Many medical diagnostic and treatment tools are being made portable and rugged enough to be taken to remote sites. Some examples are an ultrasound unit that is the size of a backpack, an entire intensive care-unit of equipment built into a stretcher, and a trauma pod built into a cruise missile. For many of these devices, CRT or LCD panels comprise a significant amount of the bulk and weight of the devices. The system of the present invention may provide a replacement for the CRT or LCD panel as well as an interface to the control system of the device, while providing communications access through an interface to the remote site’s existing communications equipment.

Industrial applications include use by inspection or maintenance crews in remote or dangerous environments such as oil refineries, drilling rigs, power plants, etc., where the personnel can move around with their hands and peripheral vision free to attend to their own safety and tasks. They would be in constant contact with the information they needed and any technical assist could be given by individuals looking at the return video images from the user.

An example of a commercial application is for mission control and other operations personnel who presently must sit at a display console for hours at a time. These individuals could make use of the system of the present invention to increase their mobility and efficiency.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a diagrammatic illustration of the components of the system of the present invention;

FIG. 2 is block diagram illustrating communications components used by the personal access unit and general purpose node of the system of FIG. 1; and

FIG. 3 is a flowchart illustrating a method performed using the system of FIG. 1.

**DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

With reference to FIG. 1, a diagram illustrating 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 100a 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 172 in order to connect to remote local area networks 174. Alternatively, the general purpose node 150 may directly connect to the wide area network 172. The general purpose node 150 may thus act as a router for routing video, audio and control data packets between the portable 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 set up a video, audio, or data link with any other portable access unit 100-100a or remote media device 125, 180, etc, that is logged onto a network 170-174. The headset 102a may comprise a heads-up display 120 in FIG. 2) inside a headset embodying a transparent color LCD device. Using control keys or voice commands, a user of the portable access unit 100-100a may select a local or remote portable access unit 100-100a on a selection list 190 of other portable access units 100-100a or media devices 125, 180. The selection list 190 comprises a combination of the lists of connections stored on all of the general purpose nodes 150-150a. Users may further access a nameserver located on the access node 150 for locating remote unfamiliar portable access units 100-100a or remote media devices.

By selecting entries from the selection list 190, users may communicate with portable access units 100-100a or various media devices such as cameras 125, internet phones 104, one or more computers 180-182 located throughout the networks 170-174. A user may further select from the list 190 user names representing users of other portable access
units 100 that are logged in and associated with remote
general purpose nodes 150a connected to the networks
170-174.

With reference to FIG. 2, the components of the access
node 150 and the wearable headset embodiment of the
portable access unit 100a is shown. Elements for both the
general purpose access node and portable access unit 100a
include a communications device 202. Data processing
functions are implemented in the form of an audio/video
coder/decoder (codec) pair 200, one codec 200 comprising
part of the portable access unit 100a and the other codec 200
being part of another portable access node 100a or remote
media device for which it is desired to exchange signals.
At a portable access node, the codec 200 controls a digital data
stream which is fed to the communications device 202,
which is implemented as an RF modem transceiver pair with
an equivalent communications device 202 located in the
general purpose access node. The codecs 200 serve as the
interfaces to the external elements (including possibly the
user display 102a and the sensor 104) on both sides of the
communication continuum comprising 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 pro-
tocol 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 commu-
nications device 202. Multiple implementations of the com-
unication 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.

The communication device 202 is designed to operate in
a high multipath space station or terrestrial indoor environ-
ment 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 (1×10^-5), 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 high-order quadrature amplitude modula-
tion); the order chosen reflects the necessary user data
volume to be supported within fixed, FCC-specified band-
width allocations. Orthogonal frequency division multiplex-
ing, 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 differ-
ent frequency front ends for system use in different
frequency bands.

Low-rate, single user implementations of the communi-
cations 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, how-
ever, and therefore unsuitable to real-time video telesco-
fencing 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 proto-
col circuits 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 circuitry
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., or 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
(GLASSTRON 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, Bright-
ness range: 2.0 OOM_max
FOV: 40-60 deg, Gray scale: >12
EyeRelief: 20-26 mm TSP, 14/10 mm (on/off-axis) exit
pupil
Unit: 2:1 across ½ FOV, GLARE:<2.5% image content,
PixelContrast:25
FOCUS: Hands off, Obs: % look-around, Diopter
range: ±2,
Mag: 1±4%, Cont: >95%, motion sensor 10° cone, Inter.
Eye. adj: 52-72 mm
Image Ethanol & 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 H.263 based video, ITU G.722 based audio, and ITU H.221 based multiplexing. The audio video codec 200 in the portable access unit 100-100a can establish a link with a similar audio/video codec 200 associated with another portable access unit 100-100a or a remote media device 104, 125, 180 or 182. The signals from the codec 200 in the portable access unit 100ze outputs the received and decompressed remote signals from the device for which the link was established. The interface between the codec 200 and communication device 202 as well as between the communication devices 202 of the general purpose node 150-150a and portable access unit 100-100a operate two-way with a high bandwidth suitable for transmitting video. Of this bandwidth, the audio portion utilizes up to 64 kbps and the data from the sensor 104 utilizes the required amount for the type of sensor 104, with the remainder allocated to compressed 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 audio/video codec 200 portion of the portable access unit 100-100a may further comprise video input and output ports, audio input and output ports, data input and output ports, and a the above-mentioned multimedia processor chip for packaging signals for data compression and decompression for transmission. Exemplary multimedia processors include the VCPEX chip by 8x8, 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 read-only 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 pulse oximeter 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 150-150ze, 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 180-182ze for display and logging of the real-time sensor signals.

The headset 102za comprises a head-up display 120 comprising a transparent color LCD device for video signals received and processed by the codec 200. The headset 102za may further comprise, or have attached thereto, an integrated microphone 122 for receiving voice commands from the user of the portable access unit 100za or for communicating voice signals to a remote portable access unit 100 or remote media device. The headset may further comprise a speaker or earpiece unit for presenting audio signals to the user. The portable access unit 100za may further comprise a digital camera 106 that may either be attached on the user’s person, or to the headset 102za 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 inputs on the headset 102za, portable access unit 100za, 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 100-100za 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 100ze and the selected network device, step 410. The selected network device may comprise the processor 180 or other 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 a remote user, or another portable access unit 100-100a over a remote general purpose node 150ze. 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 the portable access unit 100za 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 matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A communication system comprising:
   a portable access unit comprising a wearable device, a touchpad and a transceiver;
   wherein subsequent to establishing the data link with the first media device from the list to establish a data link with one or more media devices connected to the general purpose node, wherein the portable access unit is configured to receive, at the touchpad, a first user command for selecting a first media device from the list to establish a data link with the first media device via the general purpose node;
   wherein subsequent to establishing the data link with the first media device, the portable access unit is configured to display on the transparent display a list of one or more media devices that are connected to the general purpose node, wherein the portable access unit is configured to receive, a camera for providing video signals for display as the multimedia content on the portable access unit; a display for receiving video signals transmitted from the portable access unit for presenting on the display; a speaker for receiving audio signals transmitted from the portable access unit for presenting on a speaker attached to the portable access unit.
3. The system of claim 1, wherein the first media device comprises a processor, wherein the portable access unit is configured to transmit control commands to the first media device.

4. The system of claim 1, wherein the portable access unit further comprises a sensor for collecting data and is configured for transmitting data collected by the sensor to the first media device.

5. The system of claim 4, wherein the sensor comprises a biological sensor or an environmental sensor.

6. The system of claim 1, wherein the first media device comprises a sensor for collecting data and configured for transmitting data collected by the sensor to the portable access unit.

7. The system of claim 6, wherein the sensor comprises a biological sensor or an environmental sensor.

8. The system of claim 1, wherein the first media device is wirelessly or electrically connected to the network.

9. The system of claim 1, wherein the portable access unit is referred to as a first portable access unit, wherein the system comprises a plurality of portable access units comprising the first portable access unit, each portable access unit being capable of wirelessly connecting to the general purpose node for establishing a data link with the one or more media devices.

10. The system of claim 9, wherein the general purpose node is referred to as a first general purpose node, wherein the system comprises a plurality of general purpose nodes comprising the first general purpose node, wherein each general purpose node is configured for communicating with a subset of the plurality of additional portable access units.

11. The system of claim 10, wherein each portable access unit is configured for dynamically associating with and de-associating from one of the plurality of general purpose nodes.

12. The system of claim 11, wherein each portable access unit is configured for listing on its display one or more portable access units that are associated with one of the plurality of general purpose nodes.

13. The system of claim 11, wherein each portable access unit is configured for listing on its display the one or more media devices.

14. The system of claim 13, wherein each portable access unit is configured to present on its display biological data for a user of at least one of the other portable access units in response to selection of the at least one other portable access unit displayed in the list.

15. The system of claim 1, wherein the portable access unit further comprises a camera configured to capture motion images and transmit with the wearable device, wherein the transceiver is capable of transmitting a video data stream of the captured motion images to the first media device.

16. The system of claim 15, wherein the portable access unit is configured to receive, via the touchpad, a second user command for transmitting the video data stream to the first media device.

17. The system of claim 1, wherein the portable access unit is configured to update the list of one or more media devices connected to the general purpose node such that a disconnected device is removed from the list.

18. The system of claim 1, wherein the portable access unit comprises a codec configured to encode and decode the multimedia content, wherein the multimedia content includes video and audio data, and the codec is configured to encode and decode the video and audio data.

19. The system of claim 18, wherein the portable access unit further comprises a multimedia processor configured to compress and decompress the video and audio data.

20. The system of claim 1, wherein the portable access unit further comprises a microphone configured to capture sound, wherein the transceiver is capable of transmitting an audio data stream of the captured sound to the first media device.

21. The system of claim 1, wherein the portable access unit further comprises a codec configured to: multiplex encoded video information with an external data stream to generate an outgoing data stream; and demultiplex encoded video information from an incoming data stream.

22. The system of claim 1, wherein the transceiver comprises: a transmitter configured to transmit multimedia data over a wireless communication link; and a receiver configured to receive multimedia data over a wireless communication link.

23. The system of claim 1, wherein the multimedia content comprises video data captured by the first media device subsequent to establishing the data link.

24. The system of claim 1, wherein the multimedia content comprises video data generated prior to establishing the data link.

25. A method comprising: providing a portable access unit comprising a wearable device, a touchpad and a transceiver, the wearable device comprising a transparent display; wirelessly connecting, by the transceiver, to a general purpose node for establishing a data link between the portable access unit and one or more media devices connected to the general purpose node; subsequent to connecting to the general purpose node, displaying, on the transparent display, a list of one or more media devices that are connected to the general purpose node; receiving, via the touchpad, a first user command for selecting a first media device from the list to establish a data link between the portable access unit and the first media device via the general purpose node; and subsequent to establishing the data link with the first media device, displaying a multimedia content on the transparent display.

26. The method of claim 25, further comprising performing one or more of: receiving video signals from the first media device for presenting the multimedia content on the transparent display; transmitting video signals to the first media device for presenting via a display on the first media device; transmitting audio signals to the first media device for presenting via a speaker on the first media device; and receiving audio signals captured by the first media device from the first media device for presenting via a speaker.

27. The method of claim 25, further comprising transmitting control commands from the portable access unit to the first media device.

28. The method of claim 25, further comprising receiving data captured by a sensor on the first media device, wherein the sensor comprises a biological sensor or an environmental sensor.

29. The method of claim 25, wherein the general purpose node is one of a plurality of general purpose nodes, the method further comprising performing one or more of: (i) dynamically associating with one or more of the plurality of
general purpose nodes, and (ii) de-associating from one or more of the plurality of general purpose nodes.

30. The method of claim 29, further comprising presenting, on the transparent display, a list of a plurality of portable access units that are associated with the general purpose node.

31. The method of claim 25, further comprising presenting biological data for a user of another one of a plurality of portable access units in response to selection of the user's name from a list of users of the plurality of portable access units.

32. The method of claim 25, further comprising: capturing motion images via a camera; and transmitting a video data stream of the captured motion images to the first media device.

33. The method of claim 32, further comprising receiving, via the touchpad, a second user command for transmitting the video data stream to the media device.

34. The method of claim 25, further comprising updating the list of one or more media devices connected to the general purpose node such that a disconnected device is removed from the list.

35. The method of claim 25, further comprising performing one or more of: (i) encoding video and audio data included in the multimedia content, and (ii) decoding video and audio data included in the multimedia content.

36. The method of claim 25, further comprising performing one or more of: (i) compressing video and audio data included in the multimedia content, and (ii) decompressing video and audio data included in the multimedia content.

37. The method of claim 25, further comprising: capturing sound via a microphone; and transmitting an audio data stream of the captured sound to the first media device.

38. The method of claim 25, further comprising performing one or more of: (i) multiplexing encoded video information with an external data stream to generate an outgoing data stream, and (ii) demultiplexing encoded video information from an incoming data stream.

39. The method of claim 25, further comprising performing one or more of: (i) transmitting multimedia data over a wireless communication link, and (ii) receiving multimedia data over a wireless communication link.

40. The method of claim 25, further comprising: receiving video data captured, subsequent to establishing the data link, by the first media device; and displaying the multimedia content on the transparent display based on the received video data.

41. The method of claim 25, further comprising: receiving, from the first media device, video data generated prior to establishing the data link; and displaying the multimedia content on the transparent display based on the received video data.