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3 VOICE ACTIVATED CONTROLS FOR TACTICAL SONAR DISPLAYS
4

5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by or for the Government of the United States of America for
8 governmental purposes without the payment of any royalties
9 thereon or therefor.
10

11 BACKGROUND OF THE INVENTION

12 1. Field of the Invention

13 The present invention relates to control and display
14 systems and more particularly suited for sonar applications that
15 utilize voice commands to simplify the operators' task and to
16 reduce the operators' fatigue from handling scenarios involved
17 in the underwater environment.

18 2. Description of the Prior Art

19 Sonar systems commonly employ monitors to display
20 parameters involved in the detection, classification, and
21 localization of targets. The determination commonly involves an
22 operator that manipulates keyboard entries, control switches,
23 and views associated monitors displaying the problem as it is
24 being solved by a sonar system. Because the problem being

1 solved involves many variables, most of which need to be
2 determined by the operator, the operator's task at times can be
3 overwhelming.

4 The operator has been given assistance in reducing his/her
5 tasks by employing a computer in a graphic-based operating
6 environment comprising rectangular, scrollable viewing areas,
7 scrollable lists or re-sizable areas that confine and display a
8 portion of the problem being solved. Although the graphic-based
9 system assists the operator, the use of those graphical based
10 controls presents new problems that further burden the operator
11 in performing the desired task. For example, the usage of
12 graphical controls does not completely negate the need of
13 keyboard entries while at the same time increases the usage of
14 mouse clicks in the performance of scenarios related to
15 underwater detection, classification and localization. Further,
16 the usage of graphic controls creates new problems of pop-up
17 display dialogs and menus visually covering tactical data needed
18 to be examined by the operator in order to perform the desired
19 scenarios. Further still, utilizing display controls and
20 command buttons occupies room on the display monitor that could
21 be better utilized by displaying tactical data to assist the
22 operator. Accordingly, there is a need to provide for a control
23 and display system particularly suited for sonar applications
24 that utilize simple voice commands to replace the normally

1 needed multiple operator entries and do not suffer the
2 hindrances of pop-up menus and hidden display contents.
3

4 OBJECT OF THE INVENTION

5 It is an object of the present invention to utilize simple
6 voice commands to replace the normally needed multiple operator
7 entries commonly involved in the scenario of handling and
8 solving underwater detection, classification, and localization
9 problems.

10 It is another object of the present invention to eliminate
11 the need for keyboard entries or mouse clicks in performing
12 scenarios related to underwater detection, classification, and
13 localization. More particularly, it is an object of the present
14 invention to provide simple voice commands for performing
15 scenarios related to underwater detection, classification, and
16 localization and freeing the operator from making keyboard
17 entries and mouse clicks.

18 It is a further object of the present invention to avoid
19 using a pop-up menu or dialog viewing area of a display which
20 would hide other needed display information. More particularly,
21 it is an object of the present invention to use voice commands
22 in performing scenarios so as to avoid pop-up display dialog or
23 menus from visually covering tactical data needed in the
24 performance of the scenarios.

1 It is still a further object of the present invention to
2 increase the viewing area made available for displaying scenario
3 information. More particularly, it is an object of the present
4 invention to use voice commands, in lieu of using display
5 controls and command button activation, thereby leaving more
6 room for more tactical data to be displayed.

7 Moreover, it is an object of the present invention to
8 streamline the manner in which the operator handles tactical
9 scenarios.

10 In addition, it is an object of the present invention to
11 reduce operator fatigue involved in handling tactical scenarios.

12 Furthermore, it is an object of the present invention to
13 simplify the training that prepares the operator to handle
14 tactical scenarios involving underwater detection, classifi-
15 cation, and localization.

16 17 SUMMARY OF THE INVENTION

18 The present invention is directed to a control and display
19 system that utilizes simple voice commands to replace multiple
20 operator entries so as to reduce the complexity of the tactical
21 scenarios of underwater detection, classification, and
22 localization required to be handled by a sonar operator.

23 The control and display system comprises a first and second
24 display system respectively responsive to first and second

1 control elements, and a first computer system having a first
2 processor with first, second and third computer programs running
3 therein. The first computer system is responsive to the first
4 display system. The control and display system further
5 comprises a second computer system having a second processor
6 having fourth, fifth, and sixth computer programs running
7 therein. The second computer system is responsive to the second
8 display system whose displays are utilized as output devices of
9 the sixth computer program. The control and display system
10 further comprises a network interface mechanism interconnecting
11 the first and second computer system and being respectively
12 responsive to the second and fifth computer programs, and a
13 microphone. The first computer program manages the execution of
14 all programs running in the first processor and services the
15 first display system. The fourth computer program manages the
16 second processor and services the second display system. The
17 third computer program acquires voice commands from an operator,
18 via the microphone. The microphone is connected to the first
19 computer system and provides electrical signals representative
20 of spoken words to the third computer program. The third
21 computer program determines if the command is a valid, and if
22 the command is valid, a command string initiated by the third
23 computer program is sent to the second computer system, via the
24 network interface mechanism. The sixth computer program

1 comprises a program that translates voice command strings from
2 the third computer program into display directives needed by the
3 sixth computer program.

4 5 **BRIEF DESCRIPTION OF THE DRAWINGS**

6 FIG. 1 is the sole diagram of the present invention and
7 illustrates a block diagram of the control and display system of
8 the present invention.

9 10 **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

11 With reference to the drawings, wherein the same reference
12 number indicates the same element throughout, there is shown in
13 FIG. 1 a block diagram of the control and display system 10 of
14 the present invention. The control and display system 10 is
15 particularly suited for sonar applications for detection,
16 classification, and localization by means of acoustic signals.
17 The control and display system 10 allows the operator to select
18 and enter parameters involved with solving the sonar problem and
19 provides a visual observable presentation of the information,
20 such as the data entered into a computer, as well as the data
21 provided by the computer in solving the sonar problems. The
22 control and display system 10 comprises a first computer system
23 12, a second computer system 14, and a network interface 16.

1 The first computer system 12 includes a microphone 18 and a
2 display 20 responsive to control elements as known in the art.

3 The first computer system 12 includes a first processor 22,
4 acting as a server processor and having running therein
5 comprising first, second, and third computer programs 23, 25,
6 27, with the third computer program 27 shown as comprising
7 Application Program Interfaces (APIs) 24 and 26. The APIs 24
8 and 26 comprise a Voice Acquisition System (VAS) that utilizes
9 the microphone 18. The third computer program 27 (VAS) acquires
10 commands from an operator via the microphone 18 by utilizing API
11 24 and sends the resulting commands to a sixth computer program
12 39 (AEP), to be further described, via API 26. The third
13 computer program 27 (VAS) is of particular importance to the
14 present invention. The APIs 24 and 26 may be respectively
15 *Dragon Naturally Speaking™* ACTIVEX Module (API) and Standard
16 Network TCP/IP API both known in the art.

17 The first and second computer programs 23, 25 running in
18 the server processor 22 are standard commercially available
19 operating system components. The first computer program 23 is a
20 standard operating system, which manages the execution of all
21 programs running on computer system 12 and services display 20.
22 The second computer program 25 is a standard operating system
23 component, which manages the transfer of standard protocol
24 messages to/from computer system 12 across a network, such as

1 network interface 16, to other computer systems, such as the
2 second computer system 14.

3 The second computer system 14 includes displays 30 and 32,
4 each responsive to control elements as known in the art, which
5 are utilized as output devices of a sixth computer program 39.
6 The second computer system 14 includes a second processor 34
7 acting as a client processor and having running therein fourth,
8 fifth, and sixth computer programs 35, 37, 39, with the sixth
9 program 39 shown as comprising Application Program Interfaces
10 (APIs) 36 and 38.

11 The sixth computer program 39 is known as the Augmentation
12 Enhancement Package (AEP), which is comprised of the Command
13 Interpreter Module (CIM) API 36 and Standard Network TCP/IP API
14 38. The Command Interpreter Module (CIM) API 36 translates
15 voice command strings from the third computer program, running
16 in the first computer system 12, into display directives
17 required by the sixth computer program (AEP). The Standard
18 Network TCP/IP API 38 is a standard operating system component.
19 The Command Interpreter Module (CIM) API 36 is of particular
20 importance to the present invention.

21 The fourth and fifth computer programs 35, 37 are standard
22 commercially available operating system components. The fourth
23 computer program 35 is a standard operating system, which
24 manages the execution of all programs running on the second

1 computer system 14. The fifth computer program 37 is a standard
2 operating system component, which manages the transfer of
3 standard protocol messages to/from the second computer system 14
4 across a network interface 16 to other computer systems, such as
5 the first computer system 12, and may utilize a Standard Network
6 Interface Process, the fifth computer program 37 known in the
7 art and utilizes the network interface 16 in operative
8 cooperation with the Standard Network Interface Process, the
9 second computer program 25 of the first computer system 12.

10 The server processor 22 may be any computer that is capable
11 of running the first, second and third computer programs 23, 25,
12 27. The first computer program 23 may be a standard
13 commercially available operating system that includes a Standard
14 Network Interface Process as a standard operating system
15 component operating system. For one embodiment of the
16 invention, the server processor 22 may be a Personal Computer
17 (PC) running the *Windows NT* operating system as the first
18 computer program 23.

19 The second computer program 25 running in the server
20 processor 22 may be a standard operating system component, which
21 manages the transfer of standard protocol messages to/from the
22 first computer system 12 across the network interface 16 to the
23 second computer system 14 having client processor 34 and may be
24 the Standard Network Interface Process, the second computer

1 program 25 that operatively cooperates with the Standard Network
2 Interface Process, the fifth computer program 37 of the client
3 processor 34.

4 The third computer program 27, comprised of Application
5 Program Interfaces (APIs) 24 and 26 accepts a verbal command
6 from the operator via the microphone 18, determines if the
7 command is valid (i.e., from the specified command set) and if
8 the command is valid, sends a command string, via the network
9 interface 16 mechanism using the second computer program 25, to
10 the sixth computer program 39 running in the client processor
11 34.

12 For one embodiment of the invention, the third computer
13 program 27 may be written in *Visual Basic* and incorporates the
14 *Dragon NaturallySpeaking™* ACTIVEX Module API 24 for controls
15 including *DgnVoiceCmd* to accept a verbal command from the
16 operator, by way of microphone 18, and to validate that command,
17 and *DgnMicBtn* for microphone 18 operations. *Dragon Naturally*
18 *Speaking™* is a voice recognition system, which converts spoken
19 words into computer text. The *Visual Basic* program uses the
20 Standard Network TCP/IP API 26 to communicate with the client
21 processor 34 and to send the validated command strings to the
22 client processor 34. The first, second and third computer
23 programs 23, 25, 27 are all known in the art.

1 The client processor 34 may be any computer, which may run
2 the fourth, fifth, and sixth computer programs 35, 37, 39. The
3 fourth computer program 35 may be a Unix Operating System for
4 running and managing numerous processes, in a manner known in
5 the art. The fifth computer program 37 may be a standard
6 operating system component, which manages the transfer of
7 standard protocol messages to/from the second computer system 14
8 across the network 16 to the first computer system 12 and may be
9 the Standard Network Interface Process, the fifth computer
10 program 37 that operatively cooperates with the Standard Network
11 Interface Process, the second computer program 25 of the server
12 processor 22.

13 The sixth computer program 39 is known as the Augmentation
14 Enhancement Package (AEP), which is comprised of the Command
15 Interpreter Module (CIM) API 36 and the Standard Network TCP/IP
16 API 38. The Command Interpreter Module (CIM) API 36 translates
17 voice command strings from the third computer program 27 running
18 in the first computer system 12 into display directives required
19 by the sixth computer program 39 (AEP) running in the second
20 computer system 14.

21 The sixth computer program 39 running in the client
22 processor 34 may also be designed as the Man-Machine Interface
23 (MMI) between a sonar acoustical processor and the sonar
24 operator. Utilizing a Graphical User Interface (GUI), the sonar

1 operator is presented with acoustical information, tactical
2 information and numerous graphical controls with which the
3 information can be accessed and manipulated to perform the
4 detection, classification and localization functions. During
5 the course of accessing and manipulating the information, the
6 sonar operator is required to display multiple control menus
7 and/or activate multiple controls.

8 The server and client processors 22 and 34, respectively,
9 are connected by the network interface 16, which may comprise an
10 Ethernet interface known in the art. The data communication
11 between the server and client processors 22 and 34 is
12 respectively handled by Standard Network Interface Processes,
13 the second and fifth computer programs. The second and fifth
14 computer programs 25, 37 utilize standard protocols of a
15 Standard Network Interface Process (such as available in *Windows*
16 *NT* Operating System and *Unix* Operating System).

17 In general, the control and display system 10 uses a
18 client/server architecture. This client/server architecture is
19 used primarily so that the client processor 34, acting as the
20 receiving machine, can receive from the server processor 22,
21 acting as the supplying machine, the voice commands information
22 entered by the operator by way of the microphone 18. Both the
23 client and the server processors 22 and 34, respectively, go

1 through different procedures to ready themselves for networking
2 by using standard network TCP/IP protocol mechanisms.

3 The client processor 34 application program, that is, the
4 sixth computer program, is preferably written in C, and uses the
5 *X Window System*, which is a portable, network transparent window
6 system, which provides all display functions including window
7 layouts, graphics output, and keyboard and mouse interfaces.
8 Some of the primary files of this application program, that is,
9 the sixth computer program, include; (1) *comm.c* which contains
10 the communication routines that utilize sockets; (2)
11 *MessageHandler.c* which processes the incoming and completed
12 messages; (3) *WidgetHandler.c* which handles all events, callbacks
13 and widgets; and (4) *MapVoiceCommand.c* which interprets the
14 command and performs the specified actions via widgets included
15 in the *WidgetHandler.c*. All of the routines making up the sixth
16 computer program operatively cooperate with each other in a
17 manner known in the art.

18 The sixth computer program 39 referred to herein as the
19 Augmentation Enhancement Package (AEP) program is of particular
20 importance to the present invention. The AEP program generates
21 AEP command sequences representative of Voice Commands Strings
22 created by the Voice Acquisition System, the third computer
23 program 27. Both the AEP Control program and the Command
24 Interpreter Module (CIM) 36 are implemented to respond, in a

1 predetermined manner, to the Voice Commands corresponding to the
2 words of the operator spoken into the microphone 18. In some
3 cases the response is to provide dialog boxes, which are on-
4 screen menus that are displayed and make available options to the
5 viewing operator. The interrelationship between typical AEP
6 Command Sequences, Voice Commands and the Actions created by the
7 Command Interpreter Module API 36 is shown in Table 1 related to
8 tactical sonar scenarios with the terms therein being known in
9 the art.

TABLE 1

AEP Objects:	Voice Commands:	Actions:
Broadband Tracker Menu	"Open Broadband Tracker" "Close Broadband Tracker"	Opens Broadband Tracker Dialog Box Closes Broadband Tracker Dialog Box
Narrowband Display Frequency Band Radio Buttons	"Select Frequency Nband One" "Select Frequency Nband Two" . . . "Select Frequency Nband N"	Selects Frequency Band One Selects Frequency Band Two . . . Selects Frequency Band N
All Grams	"Color Green" "Color Gray" . . . "Multi-Color"	Sets All Grams to Green Intensity Colors Sets All Grams to Gray Intensity Colors . . . Sets All Grams to Multi Intensity Colors
BTH Menu	"Open BTH" "Close BTH"	Opens BTH Dialog Box Closes BTH Dialog Box
BTH Color Scale Radio Buttons	"Select BTH Color Scale MONO" "Select BTH Color Scale SNR"	Sets All BTH Displays to MONO Sets All BTH Displays to SNR
Bearing Time History (BTH) Scenarios	"Configure BTH to Akula" "BTH Oscar"	Configures BTH to Akula Configures BTH to Oscar
Search Scenarios	"TB16 Search" "TB23 Search"	Configures AEP to TB16 Towed Array Search Configures AEP to TB23 Towed Array Search
Broadband Display Menu	"Open Broadband Display" "Close Broadband Display"	Opens Broadband Display Dialog Box Closes Broadband Display Dialog Box
Narrowband Display Menu	"Open Narrowband Display" "Close Narrowband Display"	Opens Narrowband Display Dialog Box Closes Narrowband Display Dialog Box

Recording Menu	"Open Recording"	Opens Recording Dialog Box
	"Close Recording"	Closes Recording Dialog Box
Broadband LLG Menu	"Open Broadband LLG"	Opens Broadband LLG Dialog Box
	"Close Broadband LLG"	Closes Broadband LLG Dialog Box
	"LLG Band 1"	Selects Frequency Band 1
	"LLG Band 2"	Selects Frequency Band 2
Broadband Spectragrams	"Broadband Color Green"	Sets Broadband Spectragrams to Green Intensity
	"Broadband Color Gray"	Sets Broadband Spectragrams to Gray Intensity
Narrowband Spectragrams	"Narrowband Color Green"	Sets Narrowband Spectragrams to Green Intensity
	"Narrowband Green Color"	
	"Nband Color Green"	Sets Narrowband Spectragrams to Gray Intensity
	"Narrowband Color Gray"	
Narrowband Tracker Menu	"Open Narrowband Tracker"	Opens Narrowband Tracker Dialog Box
	"Close Narrowband Tracker"	Closes Narrowband Tracker Dialog Box
Right Tickmark CF Checkbox	"Right Tickmark Contact Followers On"	Enables Tickmark Contact Followers (CF)
	"Right Tickmark Contact Followers Off"	Disables Tickmark Contact Followers (CF)
Right Overlay CF Checkbox	"Right Overlay Contact Followers On"	Enables Overlay Contact Followers (CF)
	"Right Overlay Contact Followers Off"	Disables Overlay Contact Followers (CF)
Right Fast Checkbox	"Right Fast On"	Enables Fast Updates
	"Right Fast Off"	Disables Fast Updates
Right Medium Checkbox	"Right Medium On"	Enables Medium Updates
	"Right Medium Off"	Disables Medium Updates
Scan Pop-down List	"Scan Bearing Only"	Sets Scan Pop-down list
	"Scan Frequency Only"	
	"Scan Auto 5 Seconds"	
	"Scan Auto 7 Seconds"	
Stop Button	"Scan Stop"	Halts the current scan operation

Narrowband Beams Radio Buttons	"Beams 2"	Sets number of narrowband beams
	"Beams 4"	
Microphone Image	"Microphone On"	Activates voice engine
	"Microphone Off"	Deactivates voice engine

From Table 1, listing the commands commonly involved in a typical underwater detection, classification, and localization operator scenario, it is seen that the Augmentation Enhance Package (AEP), the sixth computer program 39 comprised of Command Interpreter Module API 36 and Standard Network TCP/IP API 38 is trained to respond to Simple Voice Commands. The response of the sixth computer program 39 (AEP) comprised of program packages 36 and 38 simplify the task of the operator, while at the same time give the operator more control to direct the displays involved in the scenario. Further, the operator is not burdened with making keyboard entries or mouse clicks. For example, the operator is not hindered with covered display, but rather, by saying "Scan Bearing Only" the Command Interpreter Module API and AEP program respond setting the scan pop-down list. Without the present invention, the sonar operator is required to make multiple keyboard entries and mouse clicks, as well as being hindered by pop-up and pop-down lists and hidden data parameters.

It should now be appreciated that the practice of the present invention utilizes simple voice commands to replace the

1 normally needed multiple operator entries commonly involved in
2 sonar tactical scenarios.

3 It should be further appreciated that the practice of the
4 present invention substantially eliminates the need of keyboard
5 entries and mouse clicks in performing scenario related to
6 underwater detection, classification, and localization. In
7 addition, the practice of the present invention avoids the
8 problem of a menu window viewing area hiding the needed display
9 information. Moreover, the present invention by eliminating
10 these problems increases the viewing area that is made available
11 to display tactical scenario information.

12 It should be further appreciated that the practice of the
13 present invention provides for voice commands which streamline
14 the operators handling of tactical scenarios, while at the same
15 time reduces the operator fatigue commonly involved in tactical
16 scenarios. Further, the present invention results in
17 simplifying the training necessary to be given to an operator
18 before he/she can handle tactical scenarios.

19 The invention has been described with reference to the
20 preferred embodiments and some alternates thereof. It will be
21 understood that many additional changes in the details,
22 materials, steps and arrangement of parts, which have been
23 herein described and illustrated in order to explain the nature
24 of the invention, may be made by those skilled in the art within

- 1 the principle and scope of the invention as expressed in the
- 2 appended claims.

2

3 VOICE ACTIVATED CONTROLS FOR TACTICAL SONAR DISPLAYS

4

5 ABSTRACT OF THE DISCLOSURE

6 A control and display system is disclosed that is
7 particularly suited for sonar applications. The control and
8 display system utilizes voice recognition to be responsive to
9 simple voice commands to generate and display the results of
10 complex combinations of commands. The utilization of voice
11 commands avoids such hindering display and control problems as
12 hiding tactical data, while at the same time allows for more
13 visual display to be provided for tactical data information.
14 The utilization of voice commands streamlines the manner in
15 which an operator handles tactical scenarios, reduces operator
16 fatigue when handling tactical scenarios, and simplifies
17 training the operator to handle tactical scenarios.

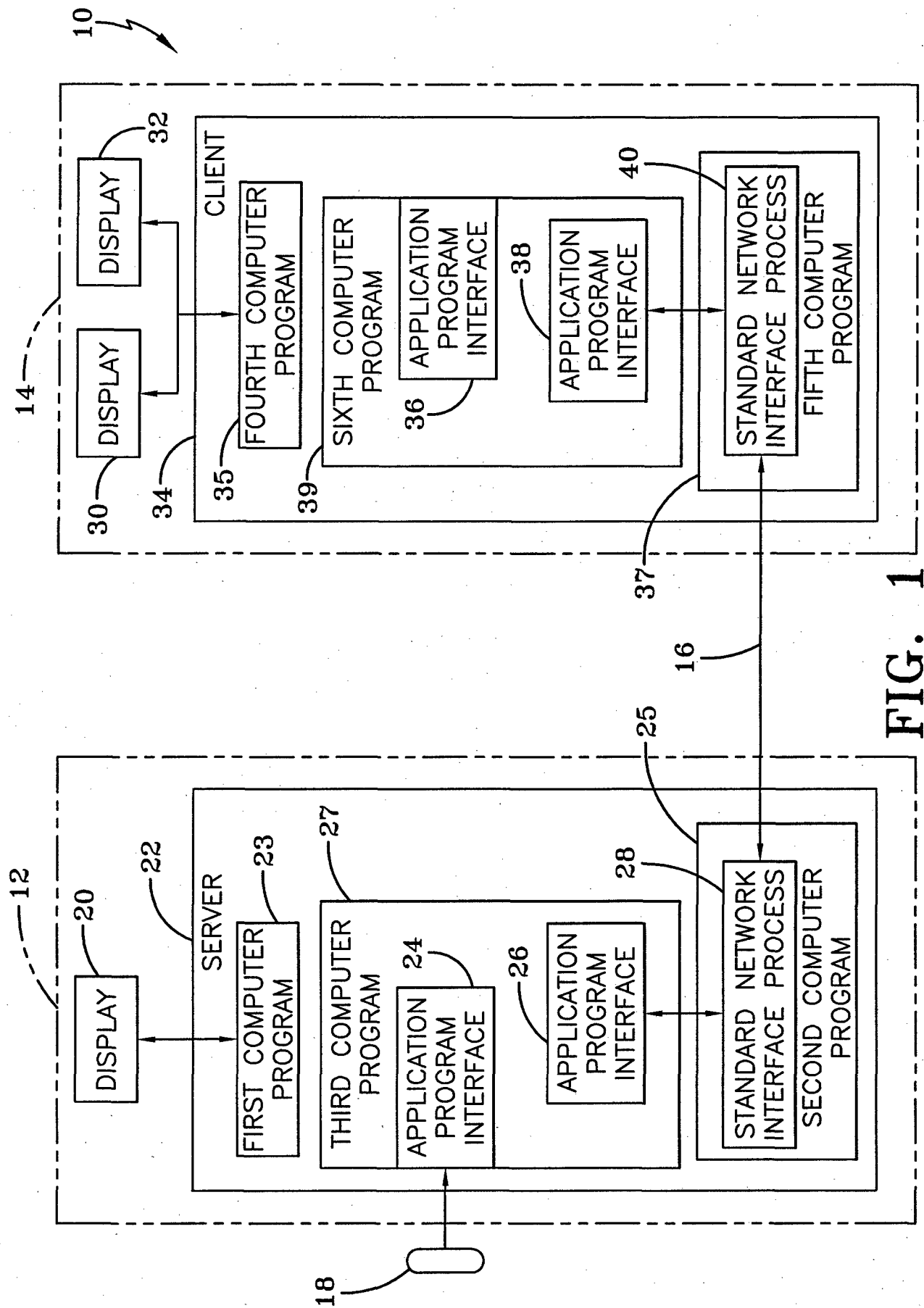


FIG. 1