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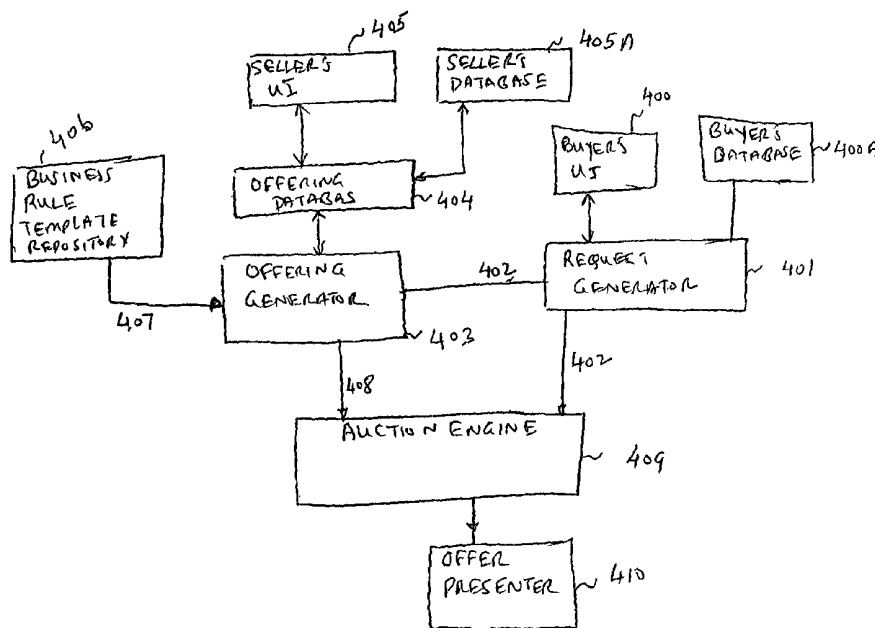
(43) International Publication Date
9 August 2001 (09.08.2001)

PCT

(10) International Publication Number
WO 01/57618 A2

- (51) International Patent Classification⁷: G06F
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- (21) International Application Number: PCT/US01/03743
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 2 February 2001 (02.02.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
09/498,023 4 February 2000 (04.02.2000) US
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
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- Published:
— without international search report and to be republished upon receipt of that report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SYSTEM FOR MULTI-DIMENSIONAL E-COMMERCE AUCTIONS



(57) Abstract: A computerized system for multi-dimensional auctions is provided to generate offers from sellers based upon buyer defined parameters and preferences. The system includes a request generator for generating a buyer's request including a scoring function based upon a buyer's preferences. The system also includes an offering generator that generates a set of offerings based upon data stored in an offering database populated with seller's information. The system further includes an auction engine that receives the set of offerings and the buyer's request with the scoring function, and thereafter generates a list of offers.



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SYSTEM FOR MULTI-DIMENSIONAL E-COMMERCE AUCTIONS

FIELD OF THE INVENTION

5 This invention relates to electronic commerce and more particularly, to a computerized system for facilitating multidimensional auctions based upon buyer defined parameters.

BACKGROUND

10 The Internet connects thousands of computers world wide through well-known protocols, for example, Transmission Control Protocol (TCP)/Internet Protocol (IP), into a vast network. Information on the Internet is stored world wide as computer files, mostly written in the Hypertext Mark Up Language (“HTML”). The collection of all such publicly available computer files is known as the World Wide Web (WWW).

15 The WWW is a multimedia-enabled hypertext system used for navigating the Internet and is made up of hundreds of thousands of web pages with images, text and video files, which can be displayed on a computer monitor. Each web page can have connections to other pages, which may be located on any computer connected to the Internet.

20 A typical Internet user uses a client program called a “Web Browser” to connect to the Internet. A user can connect to the Internet via a proprietary network, such as America Online or CompuServe, or via an Internet Service Provider, e.g., Earthlink.

 A Web Browser may run on any computer connected to the Internet. Currently, various browsers are available of which two prominent browsers are Netscape
25 Navigator and Microsoft Internet Explorer. The Web Browser receives and sends requests to a web server and acquires information from the WWW. A web server is a program that, upon receipt of a request, sends the requested document to the requesting user.

 A standard naming convention known as Uniform Resource Locator (“URL”)
30 has been adopted to represent hypermedia links and links to network services. Most files or service can be represented with a URL. URLs enable Web Browsers to go directly to any file held on any WWW server.

 Information from the WWW is accessed using well-known protocols, including

the Hypertext Transport Protocol (“HTTP”), the Wide Area Information Service (“WAIS”) and the File Transport Protocol (“FTP”), over TCP/IP protocol. The transfer format for standard WWW pages is Hypertext Transfer Protocol (HTTP).

5 With the increasing popularity of the Internet, computer based auctions are becoming an attractive business option for retailers and other business entities in the electronic commerce arena (“E-Commerce”). Generally, there are two types of auction systems, English and Vickrey. One of the most widely used forms of auctions is the English auction.

10 In the English auction, bidders openly announce binding bids to all other bidders and the auctioneer. A valid bid must be higher than the previous highest bid by at least an increment defined by the auctioneer. The auction ends if no new offers have been made for a certain period of time. The bidder who placed the last bid wins. The bidder pays the amount of this last bid. While English auctions are efficient for live auctions, the system is cumbersome for a computerized system, as it requires substantial
15 interaction amongst bidders.

The Vickrey auction approximates the results of an English auction, but does not require interaction amongst competing bidders. In a Vickrey auction, each bidder privately tells the auctioneer the highest bid the bidder is willing to make. The bidding process is not interactive. The bidder willing to make the highest bid wins the auction.
20 However, the winner only has to pay the price of the second highest bid.

Current Internet auction sites such as those provided by EBAY (<http://www.ebay.com>) and others have a “proxy bidding” feature where a user can enter the maximum price the user is willing to bid. This saves the users from having to place a large number of bids themselves, because the system can place the bids for
25 them. If all bidders in EBAY used this feature, the result would be a Vickrey auction.

So far we have discussed auctions in which buyers are competing for a seller’s products. However, other auctions are conducted where sellers are competing for a buyer’s business. These auctions are referred to as reverse auctions. In a reverse auction, the bidders are sellers competing for the business of a buyer.

30 Conventional auction systems only evaluate bids that are represented by unidimensional positive numbers, usually price alone. Traditionally, in the Vickrey and English auctions, bids are simply numbers, since numbers have the advantage that they can be compared, e.g., $\$10 > \8 .

Conventional computerized systems fail if bids are not unidimensional numbers. Conventional systems do not solve the problems of evaluating multidimensional bids, if bids include complex data for comparing attributes.

To compare a bid with various qualitative and quantitative factors, a “scoring function” f can be used such that the scoring function assigns a number to each possible bid. Currently scoring functions have only been used in connection with standard sealed-tenders. Scoring functions have not been used to evaluate bids in a computerized system where a bid can be described by a plurality of attributes.

Thus, there is a need for a system that efficiently conducts multi-dimensional auctions where the bids may include quantitative and qualitative factors.

SUMMARY

The present invention addresses the foregoing by providing a computerized system for generating offers from sellers based upon buyer defined parameters and preferences. According to one embodiment, the present invention provides an improved multidimensional auction system, which may or may not require buyers to commit to accepting either, the winning bid or any other bid. The system includes a request generator, wherein the request generator generates a buyer’s request including a scoring function that quantifies the buyer’s preferences.

The system further includes an offering generator that generates a set of offerings based upon data stored in an offering database and the buyer’s request. The offering generator interfaces with the offering database that interfaces with a seller’s user interface, which is used to collect seller information. The offering generator also interfaces with a business rule repository that provides the business rule for generating offers.

The system also includes an auction engine that receives the set of offerings from the offering generator and the buyer’s request with the scoring function from the request generator. The auction engine generates a list of offers based upon the buyer’s request and the set of offerings. The auction engine may then adjust the highest bidder’s offer so long as it remains greater than the second highest bidder by a predetermined increment. Thereafter, the auction engine sends the list of offers to an offering presenter that presents the list of offers to a buyer. A buyer may be allowed to change buyer preferences to generate a next set of offers, hence making the system

interactive.

The present system has advantages over the existing systems. The present invention uses consistent business rules to evaluate buyer's request . The present invention also provides an adjusted offer to a buyer where the adjusted offer is such that the highest bidder's offer is greater than the second bidder's offer by a predetermined increment. Furthermore, the present invention provides an interactive system such that a buyer can interactively change preferences based upon sellers' offers.

This brief summary has been provided so that the nature of the invention may be understood quickly. A more complete understanding of the invention can be obtained by reference to the following detailed description of the preferred embodiments thereof in connection with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is block diagram of a computing system to carry out the inventive technique.

Figure 2 is a block diagram of the architecture of the computing system of Fig. 1.

Figure 3 is a block diagram showing a network topology to carry out the inventive technique.

Figure 4 shows a block diagram of the system according to one embodiment of the present invention.

Use of the same reference symbols in different figures indicates similar or identical items.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a block diagram of a computing system for executing computer executable process steps according to one embodiment of the present invention. Figure 1 includes a host computer 10 and a monitor 11. Monitor 11 may be a CRT type, a LCD type, or any other type of color or monochrome display. Also provided with computer 10 is a keyboard 13 for entering text data and user commands, and a pointing device 14 for processing objects displayed on monitor 11.

Computer 10 includes a computer-readable memory medium such as a rotating disk 15 for storing readable data. Besides other programs, disk 15 can store application

programs including web browsers by which computer 10 connects to the Internet and the reverse auction system according to one aspect of the present invention.

Computer 10 can also access a computer-readable floppy disk storing data files, application program files, and computer executable process steps embodying the present invention or the like via a floppy disk drive 16. A CD-ROM interface (not shown) may also be provided with computer 10 to access application program files and data files stored on a CD-ROM.

A modem, an integrated services digital network (ISDN) connection, or the like also provides computer 10 with an Internet connection 12 to the World Wide Web (WWW). The Internet connection 12 allows computer 10 to download data files, application program files and computer-executable process steps embodying the present invention's auction system.

Figure 2 is a block diagram showing the internal functional architecture of computer 10. As shown in Fig. 2, computer 10 includes a CPU 201 for executing computer-executable process steps and interfaces with a computer bus 208. Also shown in Figure 2 are, a WWW interface 202, a display device interface 203, a keyboard interface 204, a pointing device interface 205 and disk 15.

As described above, disk 15 stores operating system program files, application program files, web browsers, and other files. Some of these files are stored on disk 15 using an installation program. For example, CPU 201 executes computer-executable process steps of an installation program so that CPU 201 can properly execute the application program.

A random access main memory ("RAM") 206 also interfaces to computer bus 208 to provide CPU 201 with access to memory storage. When executing stored computer-executable process steps from disk 15 (or other storage media such as floppy disk 16 or WWW connection 12), CPU 201 stores and executes the process steps out of RAM 206.

Read only memory ("ROM") 207 is provided to store invariant instruction sequences such as start-up instruction sequences or basic input/output operating system (BIOS) sequences for operation of keyboard 13.

Figure 3 shows a typical topology of a computer network with computers similar to computer 10, connected to the Internet. For illustration purposes, three computers X, Y and Z are shown connected to the Internet 302 via Web Interface 202

through a gateway 301, where gateway 301 can interface N number of computers. Web interface 203 may be a modem, network interface card or a unit for providing connectivity to other computer systems over a network using protocols such as X.25, Ethernet or TCP/IP, or any device that allows directly or indirectly, computer-to-computer communications.

It is noteworthy that the invention is not limited to a particular number of computers. Any number of computers that can be connected to the Internet 302 or any other computer network may be used.

Figure 3 further shows a second gateway 303 that connects a network of web servers 304 and 305 to the Internet 302. Web servers 304 and 305 may be connected with each other over a computer network. Web servers 304 and 305 can provide content to a user from database 306 and 307. Web servers 304 and 305 can also host the present reverse auction system such that buyers and sellers may access the auction system according to the present invention. Also shown in Figure 3 is a client side web server 308 that can be provided by an Internet service provider.

Figure 4 illustrates a block diagram of a computerized multi-dimensional auction system, according to one embodiment of the present invention.

In the current auction system, sellers bid for a buyer's business. A seller's bid is based upon buyer preferences that are quantified by a scoring function "U". Given a bid, the scoring function calculates a value, or a score, that reflects how closely the bid matches the buyers preferences. The scoring function is calculated from different variables; for a given bid, the value of the scoring function depends upon what is important to the buyer and the attributes of the bid. A seller's offer is generated based upon the scoring function and certain predetermined business rules. The present system allows a multi-dimensional auction, where bids are vectors in an N dimensional space and the scoring function maps vectors to real numbers.

The vectors represent attributes of a bid. The following illustrates how a scoring function may be used for evaluating possible bids for buying apple juice. Purity, quantity and price per gallon may be the three factors that are considered in evaluating possible bids. The following are two bids, A and B:

Bid A = (80% pure, 1 gallon, \$1.20)

Bid B = (100% pure, 1 gallon, \$1.50).

A possible scoring function based upon purity, quantity and cost may be as

follows:

$$U(\text{purity, amount, price}) = \text{purity} * \text{amount} - 1.2 * \text{price}.$$

The scoring function reflects how much a buyer likes a particular bid. For illustration purposes if there are two bids A and B with scores $U(A)$ and $U(B)$, a buyer
5 prefers bid A over bid B if $U(A) > U(B)$. The present invention allows the winner of bid A to adjust the original bid with a score $U(A)$ to another score $U(A')$ such that $U(A') = U(B) + x$, where x is a predetermined increment. The buyer only sees the adjusted offer with $U(A')$ as the score from the bidder.

10 It is noteworthy that the scoring function can be different for different buyers based upon buyer preferences. Also, the system can be configured such that the buyer may not have to accept the highest offer (or any other offer).

Because the winner can adjust the winning offer downward, the present system encourages bidders to make their best offer. Hence sellers do not have to worry about making an offer that is better than necessary to win, because if they do, they can adjust
15 it.

The present system can also rank bids ordinally. A bid may be chosen by a buyer because of the bid's score and/or rank. A range within which the score lies can define a bid's rank.

20 The present auction system has the flexibility of changing the presentation of offers to buyers, since the auction presentation can strongly influence a buyer's decision to accept or reject a bid. In one embodiment, possible bid ranks are classified into a sorted list, so that all bids with ranks within the same class are presented the same way. Table 1 provides an example of how offers may be presented with rank class and scores.

Table 1

Rank	Score	Rank Class
1	93.0	1
2	90.0	1
3	89.0	1
4	88.0	2
5	85.0	2
6	82.0	2
7	82.0	2
8	80.0	3
9	78.0	3
10	77.0	3
11	65.0	3
12	45.0	3

After obtaining and sorting the initial bids, all bids may be adjusted in such a way that they stay within the same rank class. There are several ways this adjustment can be done. For example, all the bids could be adjusted to the highest score encountered in the next lower rank class. If buyers are assumed to compare bids based on their attributes, the sellers could choose to make any adjusted offer that would still have ended up in the same category. Hence, a seller could make any offers with a score that is higher than the highest score of the initial bids in the next lower class, but no higher than the seller's initial bid.

Figure 4 shows a user interface (UI) 400, utilized to generate a request from a potential buyer. UI 400 can be accessed by a buyer via the Internet on computer 202 connected to the Internet or to a network. Generally, a buyer's request may include the buyer's information, an attribute set type that describes the product or service required by the buyer, a scoring function and any other information that facilitates the auction.

Buyer information is input into buyer's UI 400 and sent to a Request Generator module 401 that generates the buyer's request and a buyer specific scoring function 402. Request generator 401 uses buyer information entered via UI 400 and any historic information available in a database 400A. Database 400A can be compiled using

historic marketing data that provides customer tastes and preferences.

Request generator 401 sends the buyer's request and scoring function 402 to an Offering Generator 403 that is linked to an offering database 404 and a business rule repository 406. The offering database 404 is populated by using seller's information entered via a seller's UI 405, and/or from historic data stored in a seller's database 405A. UI 405 can be accessed by a seller on a computer connected to the Internet or to a network.

A business rule uses data and rules provided by the sellers to construct the sellers' offers, in response to the buyer's request containing a scoring function. The business rule repository 406 provides various types of business rules. A seller can choose the most suitable one for a given product and parameterize it. Different business rules may use different algorithms to generate the offers. For example, a business rule may use numerical optimization methods to find offers from sellers that maximize the value of a buyer's scoring function. A business rule may include a cost function, a maximum value for the cost function and an adjustment function. The cost function and the maximum value functions allow sellers to meet the buyer's request based upon the scoring function. The adjustment function adjusts a given scoring function based upon a seller's offer.

After the Offering generator 403 receives the buyer's request and the scoring function 402, the offering generator 403 obtains seller's information from the offering database 404 and also identifies the business rule corresponding to the buyer's scoring function and request 402. The offering generator 403 generates a set of offerings 408. The set of offerings 408 is based upon seller's information, buyer's request and buyer's scoring function 402, information from the offering database 404 and the business rule provided by business rule repository 406. Offering Generator 403 sends the offerings 408 to an Auction Engine 409. At the same instance Auction Engine 409 receives buyer's request and the scoring function 402 from Request Generator 401.

Auction engine 409 generates an offer or a list of offers 411, based upon buyer's request and scoring function 402, and the set of offerings 408. Offer 411 is an adjusted offer, such that the highest bidder's offer is greater than the second highest bid by a predetermined increment "x". Auction Engine 409 can also allow more than one seller to adjust their offers.

Auction Engine 409 sends an offer or a list of offers 410 to an Offer Presenter

411 that presents the offer 410 to the buyer. The buyer may be provided with a list of offers where every offer has a scoring function. The buyer may also be given an option to change the request parameters and seek other offers by the foregoing system, and hence the auction process becomes interactive.

5 The present system has advantages over existing systems. In one aspect the present invention uses consistent business rules to evaluate a buyer's request that can vary based upon buyer preferences. The present invention also provides an adjusted offer to a buyer where the adjusted offer is such that the highest bidder's offer is greater than the second bidder's offer by a predetermined increment. Furthermore, the present
10 invention provides an interactive system such that a buyer can interactively change preferences.

 Although the present invention has been described with reference to specific embodiments, these embodiments are illustrative only and not limiting. Many other applications and embodiments of the present invention will be apparent in light of this
15 disclosure and the following claims.

CLAIMS

What is claimed is:

1. A computerized multidimensional auction system for generating offers from
5 sellers based upon a buyer's preferences, comprising of:
a request generator, wherein the request generator generates a buyer's request
including a scoring function based upon buyer defined preferences;
an offering generator that generates a plurality of offerings based upon seller data
stored in an offering database; and
10 an auction engine that receives the set of offerings and the buyer request with the
scoring function, and generates a list of offers.
2. The system of claim 1, further comprising of a user interface that allows a buyer
to input preferences based upon which the request generator generates the request
15 and the scoring function.
3. The system of Claim 1, further comprising of a database with historic values that
includes buyer information used by the request generator to generate the buyer's
request and the scoring function.
20
4. The system of Claim 1, wherein the request generator sends the request to the
offering generator.
5. The system of Claim 1, further comprising of a seller's user interface that allows
25 seller's to input seller information that is used by the offering generator to
generate the set of offerings.
6. The systems of Claim 1, further comprising of a business rule repository that
includes business rule templates used by the offering generator to generate the list
30 of offerings.
7. The system of Claim 6, wherein the offering generator sends the list of offerings
with the business rule to the auction engine.

8. The system of Claim 1, wherein the request generator sends the buyer's request and the scoring function to the auction engine.
- 5 9. The system of Claim 1, wherein the auction engine adjusts a highest seller's offer such that the highest offer is greater than a second highest offer by a predetermined increment.
- 10 10. The system of Claim 1, further comprising of an offering presenter that presents the list of offers generated by the auction engine to the buyer.

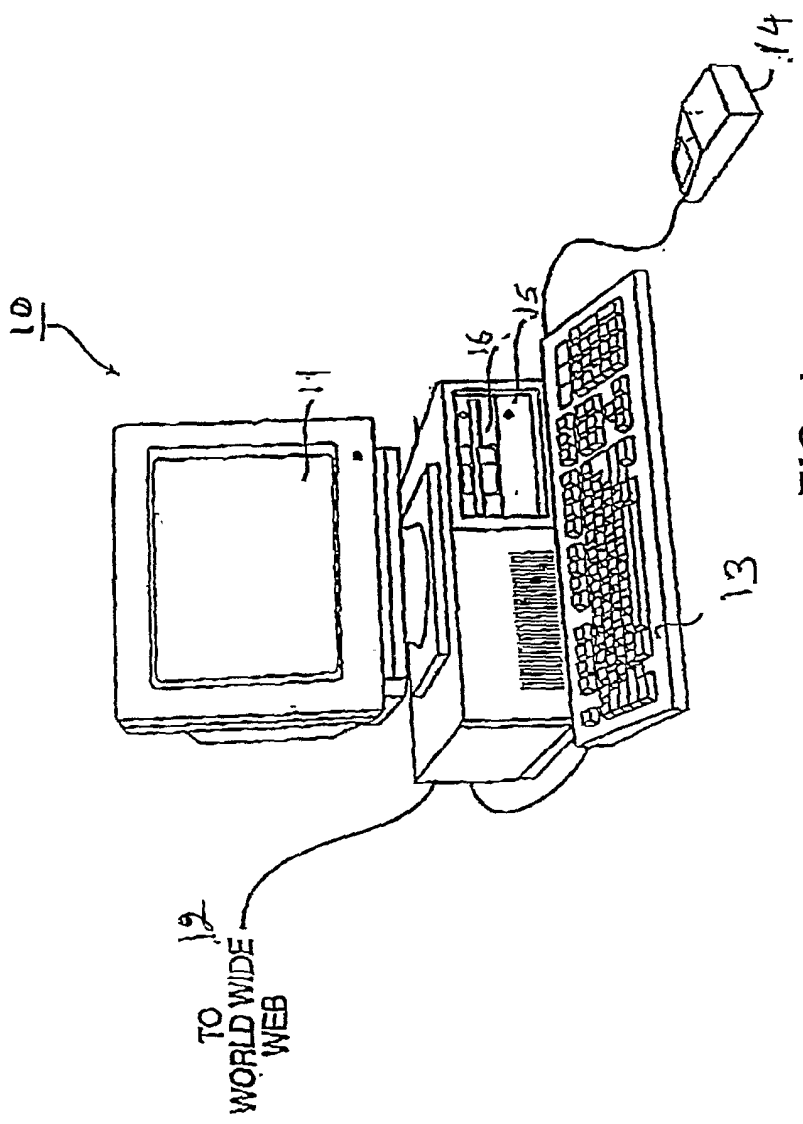


FIG. 1

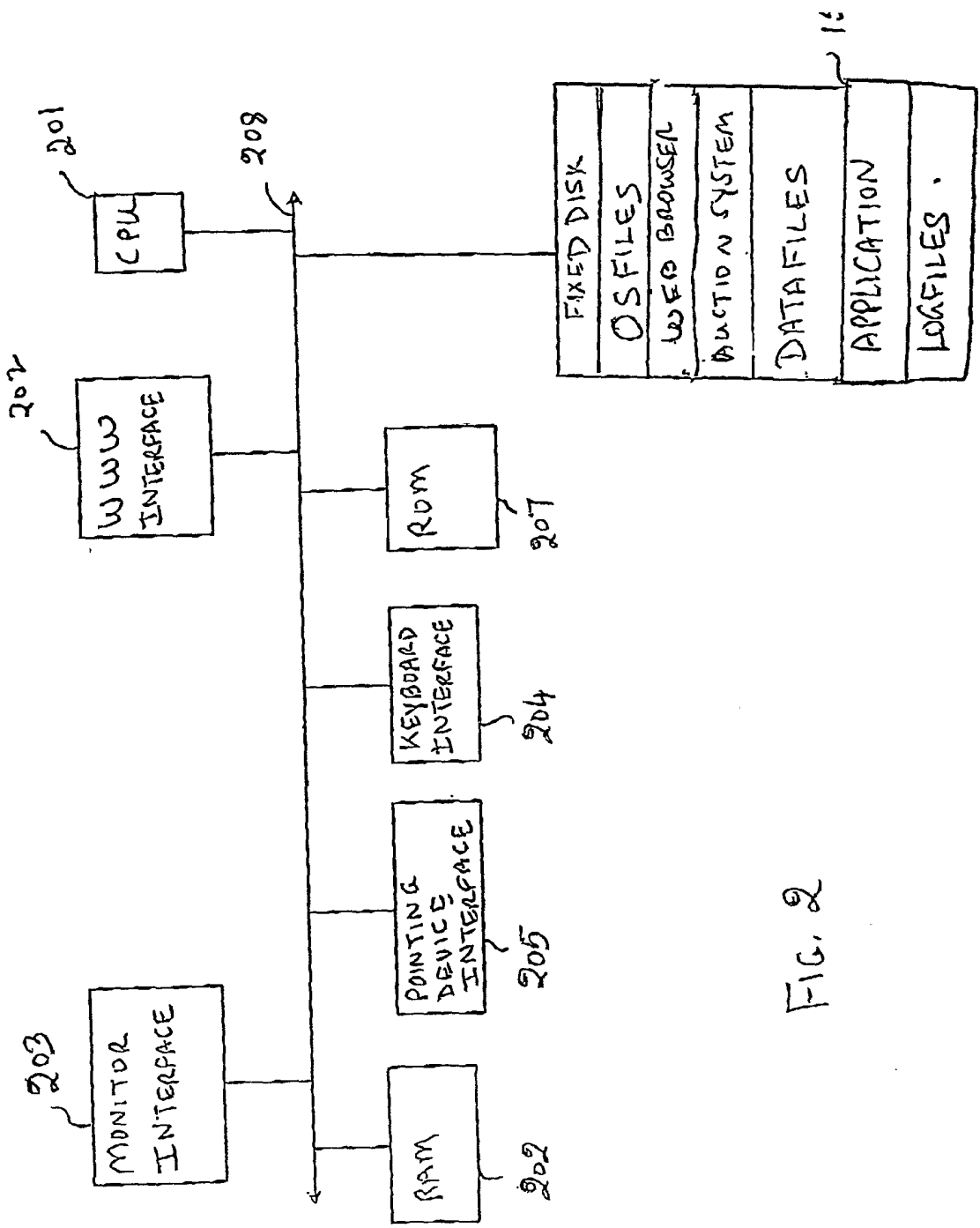


FIG. 2

