Title: SYSTEM AND METHOD FOR CONDUCTING AUCTION USING COMPUTER NETWORK

Abstract: Disclosed is a system and method for conducting an auction using a computer network. The system comprises an auction server for performing auction procedures, at least one buyer interface connected to the auction server; at least one seller interface connected to the auction server, an auction bid module receiving input of bid information including bid prices from buyers (or sellers), and an automatic price reduction module for automatically decreasing (or increasing) an auction bid price if a bid is not made by a buyer (or seller) for a predetermined time. The method comprises the steps of (1) receiving input of auction start information from a seller (or buyer); (2) transferring, by the auction server, the auction start information to the buyer (or seller) interface; (3) reducing (or increasing) the auction start price by a predetermined amount if a bid is not made by a buyer (or seller) for a predetermined time; (4) receiving bids information from buyers (or sellers) by the auction server; and (5) selecting a successful bidder by the auction server.
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.
SYSTEM AND METHOD FOR CONDUCTING AUCTION USING COMPUTER NETWORK

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to a system and method for conducting an auction between buyers and sellers using a computer network. More particularly, the present invention relates to a computerized system and method in which an opening price is automatically adjusted after the start of an auction if a bid is not made within a predetermined time, and bidding is automatically performed without having to repeatedly go through complicated processes, thereby providing an efficient and simple way to conduct an auction.

(b) Description of the Related Art

The two basic types of auctioning methods include (1) a forward auction method in which the seller names a start price at which bidding by many buyers begins, and a purchase is made by the buyer with the resulting highest bid; and (2) a reverse auction method in which the buyer names a start price and various sellers provide price offers, with the successful seller being the one with the lowest offer. There are now an ever-increasing number of companies which provide buyers and sellers the opportunity to engage in auctions via the Internet.

However, with the above auctioning methods, since the seller names the start price in the forward auction method, if auctioning begins with a high start price, an unsuccessful auction may result. This may also occur with the reverse auction method in the case where an excessively low start price is named by the buyer. Accordingly, a suitable start price at which to start bidding is essential for a successful auction.
In the case where a computer network is used, this may therefore require a computer operator to manually set the start price if auctioning does not begin with an appropriate price at which to start bidding. Further, a successful bid often requires that the buyer or seller bid many times. Therefore, with the conventional computerized auctioning method, a plurality of identical procedures must be undertaken by the buyer or seller each time a new bid is made.

**SUMMARY OF THE INVENTION**

The present invention has been made in an effort to solve the above problems.

It is an object of the present invention to provide a system and method for conducting an auction between buyers and sellers using a computer network, in which an opening price is automatically adjusted after the start of an auction if a bid is not made within a predetermined time, and bidding is automatically performed without having to repeatedly go through complicated processes, thereby providing an efficient and simple way to conduct an auction.

To achieve the above object, the present invention provides a system and method for conducting an auction between buyers and sellers using a computer network. The system comprises an auction server for performing auction procedures, at least one buyer interface connected to the auction server, at least one seller interface connected to the auction server, an auction bid module receiving input of bid information including bid prices from buyers, and an automatic price reduction module for automatically decreasing an auction bid price if a bid is not made by a buyer for a predetermined time.

According to a feature of the present invention, the system further comprises an automatic bid module for automatically establishing bid prices by increasing a bid made by another buyer by a predetermined amount.

In another aspect, an auction system comprises an auction server for performing auction procedures, at least one buyer interface connected to
the auction server, at least one seller interface connected to the auction server, an auction bid module receiving input of bid information including bid prices from sellers, and an automatic price increase module for automatically increasing an auction bid price if a bid is not made by a seller for a predetermined time.

According to a feature of the present invention, the system further comprises an automatic bid module for automatically establishing bid prices by decreasing a bid made by another seller by a predetermined amount.

The method comprises the steps of (1) receiving input of auction start information by the auction server such as an auction start price from a seller; (2) transferring, by the auction server, the auction start information to the buyer interface; (3) reducing the auction start price by a predetermined amount if a bid is not made by a buyer for a predetermined time; (4) receiving bid information from buyers by the auction server; and (5) selecting a successful bidder by the auction server.

According to a feature of the present invention, step (3) is repeatedly performed.

According to another feature of the present invention, in step (3), the predetermined amount is a value randomly determined by the auction server.

According to yet another feature of the present invention, the predetermined amount is a value randomly determined by the auction server every time step (3) is performed.

According to still yet another feature of the present invention, the auction start price is not reduced below a predetermined price.

In another aspect, the method comprises the steps of (6) receiving input of auction start information by the auction server such as an auction start price from a buyer; (7) transferring, by the auction server, the auction start information to the seller interface; (8) increasing the auction start price by a predetermined amount if a bid is not made by a seller for a predetermined time; (9) receiving bid information from sellers by the auction server; and (10) selecting a successful bidder by the auction server.
According to a feature of the present invention, step (8) is repeatedly performed.

According to another feature of the present invention, in step (8), the predetermined amount is a value randomly determined by the auction server.

According to yet another feature of the present invention, the predetermined amount is a value randomly determined by the auction server every time step (8) is performed.

According to still yet another feature of the present invention, the auction start price is not increased above a predetermined price.

In yet another aspect, the method comprises the steps of (11) receiving input of auction start information by the auction server such as an auction start price from a seller; (12) transferring, by the auction server, the auction start information to the buyer interface; (13) receiving bid information such as bid prices from buyers by the auction server; (14) selecting a successful bidder by the auction server; and (15) reporting by the auction server the successful bidder, wherein a low price and a high price is also included in the bid information received from the buyers in step (13), and bid prices are automatically established if a predetermined condition is satisfied, the bid prices being automatically established using automatic bid prices calculated using a predetermined process.

According to a feature of the present invention, the predetermined condition includes a subsequent bid price, determined by adding a first predetermined amount to another buyer’s most recent bid price after receiving bid information from the other buyer, falling within a range set by the low price and high price, and wherein the predetermined process is a process by which a second predetermined amount is added to another buyer’s most recent bid price.

According to another feature of the present invention, the method further comprises the step of (17) reducing the auction start price by a third predetermined amount if a bid is not made by a buyer for a predetermined time.
According to yet another feature of the present invention, step (17) is repeatedly performed.

According to still yet another feature of the present invention, if the auction start price is reduced below the low price, a price obtained by adding a fourth predetermined amount to the auction start price is determined to fall within the high price and the low price, and the predetermined process for automatically establishing bid prices is a process by which a fifth predetermined amount is added to the reduced auction start price.

In still yet another aspect, the method comprises the steps of (18) receiving input of auction start information by the auction server such as an auction start price from a buyer; (19) transferring, by the auction server, the auction start information to the seller interface; (20) receiving bid information such as bid prices from sellers by the auction server; (21) selecting a successful bidder by the auction server; and (22) reporting by the auction server the successful bidder, wherein a low price and a high price is also included in the bid information received from the sellers in step (20), and bid prices are automatically established using automatic bid prices calculated using a predetermined process.

According to a feature of the present invention, the predetermined condition includes a subsequent bid price, determined by subtracting a sixth predetermined amount to another seller's most recent bid price after receiving bid information from the other seller, falling within a range set by the low price and high price, and wherein the predetermined process is a process by which a seventh predetermined amount is added to another seller's most recent bid price.

According to another feature of the present invention, the method further comprises the step of (24) increasing the auction start price by an eighth predetermined amount if a bid is not made by a seller for a predetermined time.

According to still another feature of the present invention, step (24)
is repeatedly performed.

According to still yet another feature of the present invention, if the auction start price is increased above the high price, a price obtained by adding a ninth predetermined amount to the auction start price is determined to fall within the high price and the low price, and the predetermined process for automatically establishing bid prices is a process by which a tenth predetermined amount is subtracted from the increased auction start price.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate an embodiment of the invention, and, together with the description, serve to explain the principles of the invention:

Fig. 1 is a block diagram of a forward auction system according to a first preferred embodiment of the present invention;

Fig. 2 is a detailed block diagram of a forward auction server of Fig. 1;

Fig. 3 is a flow chart of operations performed by modules of the forward auction server of Fig. 2;

Figs. 4 - 8 are flow charts of operations performed respectively by a reference module, a generation module, a bid module, an automatic bid module, and an automatic price raising module according to a first preferred embodiment of the present invention;

Fig. 9 shows an example of a variation model used for an operation of an automatic price reduction module according to a first preferred embodiment of the present invention;

Fig. 10 is a flow chart of a price reduction determination process according to a first preferred embodiment of the present invention;

Figs. 11 and 12 are flow charts of operations performed respectively by a successful bidder selection module and a successful bidder reporting module according to a first preferred embodiment of the present invention;
FIG. 13 is a block diagram of a reverse auction system according to a second preferred embodiment of the present invention;

FIG. 14 is a detailed block diagram of a reverse auction server of FIG. 13;

FIG. 15 is a flow chart of operations performed by modules of the reverse auction server of FIG. 14;

FIGS. 16 – 20 are flow charts of operations performed respectively by a reference module, a generation module, a bid module, an automatic bid module, and an automatic price raising module according to a second preferred embodiment of the present invention;

FIG. 21 shows an example of a variation model used for an operation of an automatic price raising module according to a second preferred embodiment of the present invention;

FIG. 22 is a flow chart of a price raising determination process according to a second preferred embodiment of the present invention; and

FIGS. 23 and 24 are flow charts of operations performed respectively by a successful bidder selection module and a successful bidder reporting module according to a second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will now be described in detail with reference to the accompanying drawings.

FIG. 1 shows a block diagram of a forward auction system according to a first preferred embodiment of the present invention.

The forward auction system comprises buyer interface 110, a forward auction server 100, and a seller interface 140. The buyer interface 110 is an interface provided to buyers which provides information on a forward auction generated by sellers that is accessed by the buyers, thereby enabling participation in the auction by the buyers. Terminals of a two-way communications network can act as interfaces, for example, a web browser
of a buyer’s computer. The seller interface 140 is an interface provided to sellers, which generates information on the forward auction. Terminals of a two-way communications network can act as interfaces, for example a web browser of a seller’s computer.

Each of the interfaces 110 and 140 is connected to the forward auction server 100 through an Internet system using a PSTN (public switched telephone network), LAN (local area network), etc. The connection may be realized by wires, or by PCS, satellite communications, etc.

A data converter 120 for transmitting and receiving data is provided for each buyer interface 110, and a data converter 130 for transmitting and receiving data is provided for the seller interface 140. The data converters 120 and 130 include a device such as a modem or a LAN-card for suitably converting data to enable the transmission of data through a network between the interfaces 110 and 140 and the forward auction server 100.

The forward auction server 100 is a device performing the vital functions of the forward auction. In particular, the forward auction server 100 performs the generation of the forward auction, oversees the overall progression of the auction, and selects the successful bidder. As an example, a web server that is capable of performing the procedures of an auction can be used as the forward auction server 100.

FIG. 2 is a detailed block diagram of the forward auction server 100 of FIG. 1.

The forward auction server 100 includes a plurality of modules 210 – 240 for performing specific operations of the forward auction server 100, a database unit 290 for storing data required for the operation of the forward auction server 100, and a central processing unit (CPU) 245. The CPU 245 is connected to the buyer interface 110 and the seller interface 140 through a network interface 280. Further, a random number generator 285 for generating random values is connected to the CPU 245.

The modules 210 – 240 include a forward auction reference module 210 for providing details of the auction including details for monitoring the
progress of the auction for the buyers and seller, a forward auction generation module 215 for generating the auction according to a format provided by the CPU 245, a forward auction bid module 220 for enabling the buyers to participate in the auction generated by the forward auction generation module 215, a forward auction automatic bid module 225, a forward auction automatic price reduction module 230, a forward auction successful bidder selection module 235, and a forward auction successful bidder reporting module 240.

The forward auction automatic bid module 225 is able to automatically make a bid by adding a predetermined amount to the highest bid. The forward auction automatic price reduction module 230 automatically reduces a start price if the buyers have not made a bid within a predetermined time after the start of the auction.

The forward auction successful bidder selection module 235 selects a bidder as the successful bidder if another bid is not made within a predetermined time after the previous bid. The forward auction successful bidder reporting module 240 reports to the seller the successful bidder selected by the forward auction successful bidder module 235.

The database unit 290 includes a buyer database 250 for storing buyer information, a seller database 255 for storing seller information, a forward auction database 260 for storing auction information generated by the seller, a contract database 265 for storing contract information used after the successful bidder is selected, a bid details database 270 for storing bids made by the buyers during the course of an auction, and a variable database 275 for storing variables used for the operation of the forward auction automatic bid module 225 and the forward auction automatic price reduction module 230.

FIG. 3 shows a flow chart of operations performed by the modules of the forward auction server 100.

After buyers connect with the forward auction modules 210 – 240 through the buyer interfaces 110 to reference the forward auction details in
step S310, a forward auction is generated in step S320. That is, when the forward auction is generated, detailed information of the item for sale, an auction start price, and a minimum successful bidder price are input.

After the forward auction is generated, the forward auction automatic price reduction module 230 reduces the start price by a predetermined amount if a bid is not made by a buyer within a predetermined time in step S330. Next, the buyers make bids in step S340. Step S330 of reducing the start price is continuously performed until the first bid is made in step S340. When bids are made, the forward auction automatic bid module 225 can be selected by a buyer in step S350. For example, the forward auction automatic bid module 225 automatically makes a bid for buyer A higher by a predetermined amount than a bid made by buyer B, without buyer A having to repeatedly make bids. Of course, buyers using the forward auction automatic bid module 225 can set limits to how high the automatic bidding takes place.

Subsequently, the forward auction successful bidder selection module 235 selects a successful bidder or determines that there has been a mis-bid if predetermined conditions are met in step S360. If a successful bidder is selected, the forward auction successful bidder reporting module 240 reports to the seller the successful bidder in step S370.

FIG. 4 shows a flow chart of operations performed by the forward auction reference module 210.

First, the buyers and seller connect with the forward auction server 100 in steps S410 and S420, respectively, and select the forward auction reference module 210 in steps S411 and S421, respectively. The forward auction reference module 210 provides to the buyers and seller selection tools such that the buyers and seller can select items for referencing in step S430. This can be an electronic file with a list of items and/or a search tool which enables the searching for an item. In the case where an electronic file includes a list of items, information on the items such as specifications, auction start prices, items already on auction or soon to be on auction can
be provided. However, in the case where the auction items are searched, the forward auction reference module 210 provides a selection tool to the buyers and seller. An item that a buyer or seller is interested in is then selected using the selection tool respectively in steps S412 and S422.

Selection information is transmitted to the forward auction reference module 210, which searches an auction history of the selected item in the database unit 290 in step S431. The forward auction reference module 210 then generates an auction list of the selected item, and provides the list to the buyers and sellers respectively through the buyer interface 110 and the seller interface 140 in step S432. The auction list includes such information as the auction number, detailed information on the item, item quantity, item price, number of bids made on the item, the variation in price of the item from the start of the auction, etc.

The buyers and seller then check the auction list respectively in steps S413 and S423. Next, the buyers and seller and request detailed information from one of the items on the auction list in steps S414 and S424, respectively. That is, by selecting one of the items on the auction list, a hyperlink is made with the forward auction reference module 210. Accordingly, the forward auction reference module 210 searches detailed information on an item on the auction list from the database unit 290 in step S433. The detailed information is then provided to the buyers and seller in step S434. The buyers and sellers are then able to check the detailed information respectively in steps S415 and S425.

FIG. 5 shows a flow chart of operations performed by the forward auction generation module 215.

First, the seller connects with the forward auction server 100 and selects the forward auction generation module 215 in step S505. The forward auction generation module 215 provides to the seller selection tools such that the seller can select items for the start of an auction in step S510. This can be an electronic file with a list of items and/or a search tool which enables the searching of an item. In the case where an electronic file
includes a list of items, information on the items such as specifications and auction start prices. However, in the case where the auction items are searched, the forward auction generation module 215 provides to the seller an electronic file with an item list. The seller then selects an item desired for auction using the electronic file in step S515.

Selection information is transmitted to the forward auction generation module 215, which provides a file to the seller in a format enabling various selections and input to generate an item in step S520. The seller performs selections then transmits the file to the forward auction generation module 215 through the seller interface 140 in step S525. The forward auction generation module 215 then determines if the input information is correct in step S530, and if incorrect, performs step S520 again. In this case, the selections that the seller has made are left on the file, and the seller is prompted to revise only incorrect inputs. It is also possible that some selections and input are optional while others are required.

In step S530, if it is determined that the input information is correct, the detailed auction information is transmitted to the buyers in step S535. The seller then verifies the transmitted information and approves the same in step S540. The forward auction generation module 215 then generates an auction based on the detailed information provided by the seller in step S545.

When an auction is generated, selections such as a total auction time, automatic price reduction particulars, etc. can be made by the seller, but if such designations are not made by the seller, the forward auction server 100 automatically determines these parameters. The forward auction generation module 215 initializes the databases 250 – 275 with regard to auction particulars in step S550.

FIG. 6 shows a flow chart of operations performed by the forward auction bid module 220.

First, a buyer connects with the forward auction server 100 and references auction information in step S610. For example, the buyer selects the forward auction reference module 210 to receive a list of items for
possible purchase. Next, the buyer determines an item(s) that he or she would like to purchase through an auction in step S615.

Next, it is determined if auction history information of the selected item is requested in step S620. If the buyer requests auction history information for a particular item, the forward auction bid module 220 searches auction history information from the databases 250 – 275 in step S625, then transmits the auction history information to the buyer interface 110 in step S630. The buyer checks the auction history information in step S635, then determines a bid price in step S640. Here, it is possible for the buyer not to access auction history information and directly determine a bid price in step S640.

Subsequently, the buyer makes a request to make a bid in step S645 using a bid tool included in an electronic file provided when the buyer references auction information in step S610 or when the buyer is checking the auction history information in step S635. The forward auction bid module 220, which receives the bid request, provides an electronic document to the buyer through the buyer interface 110 to enable a bid to be made in step S650. The buyer makes various selections using the electronic document such as bid price, bid name, and whether the buyer wants to use an automatic bid function. In the case the buyer selects the automatic bid option, the buyer inputs a low price and a high price. After making the selections on the electronic document, the buyer transmits the document to the forward auction bid module 220 in step S655.

The forward auction bid module 220 then determines if the information input by the buyer on the electronic document is correct in step S660. That is, the forward auction bid module 220 determines if the required items on the items have been filled in or selected by the buyer. This can also include a low price and a high price if the buyer has selected the automatic bid option. The forward auction bid module 220 can also check if a bid made by the buyer is below the present price, in which the forward auction bid module 220 determines that the buyer has input incorrect information.
If it is determined that the buyer has input incorrect information in step S660, the process is returned to step S650. In this case, the selections that the buyer has made are left on the document, and the buyer is prompted to revise only incorrect inputs. However, if it is determined in step S660 that the input information is correct, a bid is established in step S665.

If the buyer selects the automatic bid option, the forward auction automatic bid module 225 automatically makes a bid for the buyer (buyer A) higher by a predetermined amount than a bid made by another buyer (buyer B), without buyer A having to repeatedly make bids. This is performed within the range of the low price and the high price input by the buyer.

When a bid is established or when the automatic bid option is selected, the forward auction bid module 220 initializes the databases 250 – 275 with regard to bid parameters in step S670.

FIG. 7 shows a flow chart of operations performed by the forward auction automatic bid module 220.

First, automatic bidding is registered in step S670. That is, with the selection of the automatic bid option by a buyer, when the forward auction bid module 220 initializes the databases 250 – 275, automatic bidding is registered. When automatic bidding is registered for a buyer (buyer A), the forward auction automatic bid module 225 remains on stand-by until a predetermined condition is met in step S710. The predetermined condition includes a bid made by another buyer (buyer B), or a reduction in the auction start price to a price below a low price input by buyer B, the reduction being made by the forward auction automatic price reduction module 230.

If the predetermined condition is satisfied in step S715, the forward auction automatic bid module 225 determines if an automatic bid history of the selected item exists in step S720. If there is no automatic bid history for the selected bid item, the process returns to step S710. However, if there is an automatic bid history for the selected bid item, the automatic bid history is searched from the databases 250 – 275 in step S725. The automatic bid buyer information includes auction information of buyers, which have an ID
number assigned when connected with the forward auction server 100. Accordingly, the information of buyer A is read at this time.

The forward auction automatic bid module 225 then searches automatic bid conditions established by buyer A using buyer A information in step S730. The automatic bid conditions includes the low price and the high price. Next, a new bid of buyer A is determined from the last bid of buyer B in step S735. At this time, it is possible for the new bid of buyer A to be a predetermined amount above a start price that has been automatically reduced. The predetermined amount can be designated by the buyer, or can be an amount pre-set in the forward auction server 100.

The forward auction automatic bid module 225 then determines if the new bid can be made in step S740. That is, it is determined if by increasing the last bid by the predetermined amount to automatically generate the new bid, the new bid falls within the range of the low price and the high price set by buyer A. It is determined that the new bid cannot be placed in step S740 if it falls outside the scope designated by the buyer.

In step S740, if it is determined that the new bid cannot be placed, buyer A is notified that the operation of the forward auction automatic bid module 225 is completed in step S745. This is realized through the buyer interface 110 used by buyer A. However, if it is determined that the new bid can be placed in step S740, step S665 of establishing a bid is performed.

FIG. 8 shows a flow chart of operations performed by the forward auction automatic price reduction module 230.

If a seller generates an auction, the forward auction generation module 215 initializes the databases 250 – 275 with regard to auction particulars in step S550. The forward auction automatic price reduction module 230 then searches the databases to extract automatic price reduction variables for the auction in progress such that variables needed for the operation of the forward auction automatic price reduction module 230 can be calculated in step S810. The extracted variables include auction participants, an auction generation price PQ, a total auction time TQ, and a
mis-bid price PX. From these extracted variables, the forward auction automatic price reduction module 230 calculates variables need for operation such as an automatic price reduction time TU, an automatic price reduction cycle DT, a number of automatic price reductions N, and a minimum start price PU.

The auction generation price PQ and the mis-bid price PX are input by a seller when generating an auction such that they are stored in the databases. The auction participants and the total auction time TQ are recorded in the databases and are determined from the time of auction generation. The automatic price reduction time TU is based on the total auction time TQ. The automatic price reduction time TU can be established by calling the random number generator 285. It is preferable that the automatic price reduction time TU is between 40% and 60% of the total auction time TQ.

The automatic price reduction cycle DT is a cycle through which the forward auction automatic price reduction module 230 operates, and can be established randomly. The automatic price reduction cycle DT is established by calling the random number generator 285. It is preferable that the automatic price reduction cycle DT is within 10% of the automatic price reduction time TU. The number of automatic price reductions N determines a total number of operations of the forward auction automatic price reduction module 230. The number of automatic price reductions N can be calculated by dividing the automatic price reduction time TU by the automatic price reduction cycle DT to a predetermined number decimal places.

The minimum start price PU is a variable established so that the forward auction automatic price reduction module 230 does not reduce an auction start price P below a certain value, that is, the minimum start price PU. The minimum start price PU is established by calling the random number generator 285.

Subsequently in step S815, the forward auction automatic price reduction module 230 remains on stand-by for the duration of the automatic
price reduction cycle DT. After the automatic price reduction cycle DT, it is
determined if there is a registered bid in step S820. If there is a registered
bid, the forward auction automatic price reduction module 230 discontinues
its operation in step S825.

However, if there is no registered bid in step S820, the auction start
price P is reduced by a reduction price DP in step S830. The reduction price
DP can be reduced every time the forward auction automatic price reduction
module 230 operates, or can be reduced by establishing a variation model
with predetermined conditions.

The remaining steps of FIG. 8 (i.e., of the forward auction automatic
price reduction module 230) will described hereinafter.

FIG. 9 shows an example of a variation model used for the forward
auction automatic price reduction module 230.

In the graph of FIG. 9, a horizontal axis represents time and a
vertical axis represents price. At the beginning of an auction, the auction is
started with the auction generation price PQ, and the auction start price P is
set as the auction generation price PQ. It is determined if there is a bid every
automatic price reduction cycle, and if there is a bid, the auction is started
with the auction start price P from the time of the bid. If there is no bid, the
auction start price P is reduced by a predetermined amount (i.e., the amount
DP).

The reduction in price DP can be varied every time it is implemented.
That is, a stand-by difference price PP in which the minimum start price PU
is subtracted from the auction start price P can be used as a variable in the
variation model. Even with continued reductions in the auction start price,
the reductions do not result in a price lower than the minimum start price PU.

FIG. 10 is a flow chart of a price reduction determination process
according to a first preferred embodiment of the present invention.

First, it is determined if the number of automatic price reductions N is
less than or equal to zero in step S1010. If this condition is not met, no more
reductions are made and the process is discontinued. However, if this
condition is met, the reduction price is first calculated using equation 1 below in step S1015.

[Equation 1]
$$ DP = \text{truncate} \left( \frac{PP}{N} \right) $$

where PP is the stand-by difference price calculated by subtracting the minimum start price PU from the auction start price P, N is the number of automatic price reductions, and truncate is the number of decimal places to which the calculation is made.

Next, in step S1020, a random variable a is established, and a random value is set as “a” based on the DP value stored in step S1015. It is possible for the “a” value to be established by the random number generator 285, and it is preferable for the “a” value to be within 50% of the DP value.

After the “a” value is established, a sign of the “a” value is randomly designated as positive or negative in step S1025. The sign can be designated by the random number generator 285. By randomly designating the sign of the “a” value, the reduction price DP is randomly set when the price is automatically reduced such that the buyers can not forecast what the reduction price DP will be.

Next, the reduction price DP is revised using equation 2 below in step S1030.

[Equation 2]
$$ DP = \text{truncate} \left( DP + a \right) $$

After the reduction price DP is revised, the number of automatic price reductions N, the stand-by difference price PP, and the auction start price P are revised using equation 3 below in step S1035.

[Equation 3]
$$ N = N - 1 $$
$$ PP = PP - DP $$
$$ P = P - DP $$

By step S1035, the stand-by difference price PP is reduced in accordance with the accumulation of the number of automatic price...
reductions N, and the number of automatic price reductions N is reduced by
the number of times the forward auction automatic price reduction module
230 has operated.

Referring back to FIG. 8, since the auction start price P is reduced in
step S1035, step S830 of reducing the auction start price P by the forward
auction automatic price reduction module 230 is completed. Next, it is
determined if the auction start price P is less than the minimum start price
PU in step S835.

If the auction start price P is less than the minimum start price PU, a
mis-bid warning message is transmitted in step S845 and the operation of
the forward auction automatic price reduction module 230 is discontinued.
The mis-bid warning message is transmitted to all buyers and sellers
involved in the present auction. However, if the auction start price P has
exceed the minimum start price PU, it is determined if the amount of time
used for automatic price reduction has exceeded the automatic price
reduction time TU in step S840.

If the time has exceeded the automatic price reduction time TU, step
S845 of transmitting the mis-bid warning message is performed and the
operation of the forward auction automatic price reduction module 230 is
ended. However, if the time has not exceeded the automatic price reduction
time TU, the reduced auction start price P is registered in the databases in
step S850. The process is then returned to step S815.

FIG. 11 shows a flow chart of operations performed by the forward
auction successful bidder selection module 235.

If a seller generates an auction, the forward auction generation
module 215 initializes the databases with respect to data related to the
generation of auctions in step S550. The forward auction successful bidder
selection module 235 then determines if there is a bid registration in step
S1110. If there is no bid registration, the forward auction automatic price
reduction module 230 is operated. However, if there is a bid registration, a
time elapsed since the most recent bid time is calculated in step S1115.
Subsequently, it is determined if the elapsed time is greater than a predetermined time in step S1120. The predetermined time can be set as needed and is five minutes in the first preferred embodiment of the present invention. If the elapsed time is greater than the predetermined time, the most recent bidder is selected as the successful bidder in step S1125.

If the elapsed time is not greater than the predetermined time, it is then determined if an auction end time has been reached in step S1130. The auction end time is calculated by adding a time for generating an auction to a total auction time. Step S1130 is also performed after the forward auction automatic price reduction module 230 is operated in the case where there is no bid in step S1110 of determining if there is a bid registration.

In step S1130, if it is determined that the auction end time has not been reached step S1110 is performed. However, if it is determined that the auction end time has been reached, step S1135 is performed. If there is no bid registration in step S1135, it is determined that there has been a mis-bid and the operation of the forward auction successful bidder selection module 235 is ended in step S1140. If there is a bid registration in step S1135, the buyer with the highest bid is selected as the successful bidder by the forward auction successful bidder selection module 235 in step S1145.

FIG. 12 shows a flow chart of operations performed by the forward auction successful bidder reporting module 240.

If the operation of the forward auction successful bidder selection module 235 is ended in step S1200, the forward auction successful bidder selection module 235 provides auction information to the forward auction successful bidder reporting module 240 such that the forward auction successful bidder reporting module 240 is operated. The forward auction successful bidder reporting module 240 searches seller information from the databases in step S1205. It is possible to for the seller information to include an email address of the seller.

The forward auction successful bidder reporting module 240 determines if there is a successful bidder from the auction information
received from the forward auction successful bidder selection module 235 in step S1210. If there is no successful bidder, the seller is notified of a mis-bid in step S1215 and the auction is ended. However, if there is a successful bidder in step S1210, auction results including buyer information are transmitted to the seller in step S1220. Next, successful bid information is transmitted to the successful bidder in step S1225 and the auction is ended.

FIG. 13 shows a block diagram of a reverse auction system according to a second preferred embodiment of the present invention.

The reverse auction system comprises a seller interface 1310, a reverse auction server 1300, and a buyer interface 1340. The seller interface 1310 is an interface provided to sellers which provides information on a reverse auction generated by a buyer that is accessed by the sellers, thereby enabling participation in the auction by the sellers. Terminals of a two-way communications network can act as interfaces, for example, a web browser of a seller's computer. The buyer interface 1340 is an interface provided to a buyer, which generates information on the reverse auction. Terminals of a two-way communications network can act as interfaces, for example a web browser of a buyer's computer.

Each of the interfaces 1310 and 1340 is connected to the reverse auction server 1300 through an Internet system using a PSTN (public switched telephone network), LAN (local area network), etc. The connection may be realized by wires, or by PCS, satellite communications, etc.

A data converter 1320 for transmitting and receiving data is provided for each seller interface 1310, and a data converter 1330 for transmitting and receiving data is provided for the buyer interface 1340. The data converters 1320 and 1330 include a device such as a modem or a LAN-card for suitably converting data to enable the transmission of data through a network between the interfaces 1310 and 1340 and the reverse auction server 1300.

The reverse auction server 1300 is a device performing the vital functions of the reverse auction. In particular, the reverse auction server 1300 performs the generation of the reverse auction, oversees the overall
progression of the auction, and selects the successful bidder. As an example, a web server that is capable of performing the procedures of an auction can be used as the reverse auction server 1300.

FIG. 14 is a detailed block diagram of the reverse auction server 1300 of FIG. 1.

The reverse auction server 1300 includes a plurality of modules 1410 – 1440 for performing specific operations of the reverse auction server 1300, a database unit 1490 for storing data required for the operation of the reverse auction server 1300, and a central processing unit (CPU) 1445. The CPU 1445 is connected to the seller interface 1310 and the buyer interface 1340 through a network interface 1480. Further, a random number generator 1485 for generating random values is connected to the CPU 1445.

The modules 1410 – 1440 include a reverse auction reference module 1410 for providing details of the auction including details for monitoring the progress of the auction for the buyer and sellers, a reverse auction generation module 1415 for generating the auction according to a format provided by the CPU 1445, a reverse auction bid module 1420 for enabling the sellers to participate in the auction generated by the reverse auction generation module 1415, a reverse auction automatic bid module 1425, a reverse auction automatic price increase module 1430, a reverse auction successful bidder selection module 1435, and a reverse auction successful bidder reporting module 1440.

The reverse auction automatic bid module 1425 is able to automatically make a bid by subtracting a predetermined amount from the lowest bid. The reverse auction automatic price increase module 1430 automatically increases a start price if the sellers have not made a bid within a predetermined time after the start of the auction.

The reverse auction successful bidder selection module 1435 selects a bidder as the successful bidder if another bid is not made within a predetermined time after the last bid. The reverse auction successful bidder reporting module 1440 reports to the buyer the successful bidder selected by
the reverse auction successful bidder module 1435.

The database unit 1490 includes a buyer database 1450 for storing buyer information, a seller database 1455 for storing seller information, a reverse auction database 1460 for storing auction information generated by the seller, a contract database 1465 for storing contract information used after the successful bidder is selected, a bid details database 1470 for storing bids made by the sellers during the course of an auction, and a variable database 1475 for storing variables used for the operation of the reverse auction automatic bid module 1425 and the reverse auction automatic price increase module 1430.

FIG. 15 shows a flow chart of operations performed by the modules of the reverse auction server 1300.

After buyers connect with the reverse auction modules 1410 – 1440 through the seller interfaces 1310 to reference the reverse auction details in step S1510, a reverse auction is generated in step S1520. That is, when the reverse auction is generated, detailed information of the item for sale, an auction start price, and a maximum successful bidder price are input.

After the reverse auction is generated, the reverse auction automatic price increase module 1430 increases the start price by a predetermined amount if a bid is not made by a seller within a predetermined time in step S1530. Next, the sellers make bids in step S1540. Step S1530 of increasing the start price is continuously performed until the first bid is made in step S1540. When bids are made, the reverse auction automatic bid module 1425 can be selected by a seller in step S1550. For example, the reverse auction automatic bid module 1425 automatically makes a bid for seller A lower than a bid made by seller B by a predetermined amount, without seller A having to repeatedly make bids. Of course, sellers using the reverse auction automatic bid module 1425 can set limits to how low the automatic bidding goes.

Subsequently, the reverse auction successful bidder selection module 1435 selects a successful bidder or determines that there has been
a mis-bid if predetermined conditions are met in step S1560. If a successful bidder is selected, the reverse auction successful bidder reporting module 1440 reports to the buyer the successful bidder in step S1570.

FIG. 16 shows a flow chart of operations performed by the reverse auction reference module 1410.

First, the buyer and sellers connect with the reverse auction server 1300 in steps S1610 and S1620, respectively, and select the reverse auction reference module 1410 in steps S1611 and S1621, respectively. The reverse auction reference module 1410 provides to the sellers and buyer selection tools such that the sellers and buyer can select items for referencing in step S1630. This can be an electronic file with a list of items and/or a search tool which enables the searching of an item. In the case where an electronic file includes a list of items, information on the items such as specifications, auction start prices, items already on auction or soon to be on auction can be provided. However, in the case where the auction items are searched, the reverse auction reference module 1410 provides a selection tool to the sellers and buyer. An item that a seller or buyer is interested in is then selected using the selection tool respectively in steps S1612 and S1622.

Selection information is transmitted to the reverse auction reference module 1410, which searches an auction history of the selected item in the database unit 1490 in step S1631. The reverse auction reference module 1410 then generates an auction list of the selected item, and provides the list to the sellers and buyer respectively through the seller interface 1310 and the buyer interface 1340 in step S1632. The auction list includes such information as the auction number, detailed information on the item, item quantity, item price, number of bids made on the item, the variation in price of the item from the start of the auction, etc.

The buyer and sellers then check the auction list respectively in steps S1613 and S1623. Next, the sellers and buyer and request detailed information from one of the items on the auction list in steps S1614 and S1624, respectively. That is, by selecting one of the items on the auction list,
a hyper link is made with the reverse auction reference module 1410. Accordingly, the forward auction reference module 1410 searches detailed information on an item on the auction list from the database unit 1490 in step S1633. The detailed information is then provided to the sellers and buyer in step S1634. The buyer and sellers are then able to check the detailed information respectively in steps S1615 and S1625.

FIG. 17 shows a flow chart of operations performed by the reverse auction generation module 1415.

First, the buyer connects with the reverse auction server 1300 and selects the reverse auction generation module 1415 in step S1705. The reverse auction generation module 1415 provides to the buyer selection tools such that the buyer can select items for the start of an auction in step S1710. This can be an electronic file with a list of items and/or a search tool which enables the searching of an item. In the case where an electronic file includes a list of items, information on the items can be specifications and auction start prices. However, in the case where the auction items are searched, the reverse auction generation module 1415 provides to the buyer an electronic file with an item list. The buyer then selects an item desired for auction using the electronic file in step S1715.

Selection information is transmitted to the reverse auction generation module 1415, which provides a file to the buyer in a format enabling various selections and input to generate an item in step S1720. The buyer performs selections then transmits the file to the reverse auction generation module 1415 through the buyer interface 1340 in step S1725. The reverse auction generation module 1415 then determines if the input information is correct in step S1730, and if incorrect, performs step S1720 again. In this case, the selections that the buyer has made are left on the file, and the buyer is prompted to revise only incorrect inputs. It is also possible that some selections and input are optional while others are required.

In step S1730, if it is determined that the input information is correct, the detailed auction information is transmitted to the buyer in step S1735.
The buyer then verifies the transmitted information and approves the same in step S1740. The reverse auction generation module 1415 then generates an auction based on the detailed information provided by the buyer in step S1745. When an auction is generated, selections such as a total auction time, automatic price increase particulars, etc. can be made by the buyer, but if such designations are not made by the buyer, the reverse auction server 1300 automatically determines these parameters. The reverse auction generation module 1415 initializes the databases 1450 – 1475 with regard to auction particulars in step S1750.

FIG. 18 shows a flow chart of operations performed by the reverse auction bid module 1420.

First, a seller connects with the reverse auction server 1300 and references auction information in step S1810. For example, the seller selects the reverse auction reference module 1410 to receive a list of items for possible purchase. Next, the seller determines an item(s) that he or she would like to sell through an auction in step S1815.

Next, it is determined if auction history information of the selected item is requested in step S1820. If the seller requests auction history information for a particular item, the reverse auction bid module 1420 searches auction history information from the databases 1450 – 1475 in step S1825, then transmits the auction history information to the seller interface 1310 in step S1830. The seller checks the auction history information in step S1835, then determines a bid price in step S1840. Here, it is possible for the seller not to access auction history information and directly determine a bid price in step S1840.

Subsequently, the seller makes a request to make a bid in step S1845 using a bid tool included in an electronic file provided when the seller references auction information in step S1810 or when the seller is checking the auction history information in step S1835. The reverse auction bid module 1420, which receives the bid request, provides an electronic document to the seller through the seller interface 1310 to enable a bid to be
made in step S1850. The seller makes various selections such as bid price, bid name, and whether the seller wants to use an automatic bid function using the electronic document. In the case the seller selects the automatic bid option, the seller inputs a low price and a high price. After making the selections on the electronic document, the seller transmits the document to the reverse auction bid module 1420 in step S1855.

The reverse auction bid module 1420 then determines if the information input by the seller on the electronic document is correct in step S1860. That is, the reverse auction bid module 1420 determines if the required items on the items have been filled in or selected by the seller. This can also include a low price and a high price if the seller has selected the automatic bid option. The reverse auction bid module 1420 can also check if a bid made by the seller is below the present price, in which the reverse auction bid module 1420 determines that the seller has input incorrect information.

If it is determined that the seller has input incorrect information in step S1860, the process is returned to step S1850. In this case, the selections that the seller has made are left on the document, and the seller is prompted to revise only incorrect inputs. However, if it is determined in step S1860 that the input information is correct, a bid is established in step S1865.

If the seller selects the automatic bid option, the reverse auction automatic bid module 1425 automatically makes a bid for the seller (seller A) lower by a predetermined amount than a bid made by another seller (seller B), without seller A having to repeatedly make bids. This is performed within the range of the low price and the high price input by the seller.

When a bid is established or when the automatic bid option is selected, the reverse auction bid module 1420 initializes the databases 1450 – 1475 with regard to bid parameters in step S1870.

FIG. 19 shows a flow chart of operations performed by the reverse auction automatic bid module 1425.
First, automatic bidding is registered in step S1870. That is, with the selection of the automatic bid option by a seller, when the reverse auction bid module 1420 initializes the databases 1450 – 1475, automatic bidding is registered. When automatic bidding is registered for a buyer (buyer A), the reverse auction automatic bid module 1425 remains on stand-by until a predetermined condition is met in step S1910. The predetermined condition includes a bid made by another seller (seller B), or an increase in the auction start price to a price above a low price input by seller B, the increase being made by the reverse auction automatic price increase module 1430.

If the predetermined condition is satisfied in step S1915, the reverse auction automatic bid module 1425 determines if an automatic bid history of the selected item exists in step S1920. If there is no automatic bid history for the selected bid item, the process returns to step S1910. However, if there is an automatic bid history for the selected bid item, the automatic bid history is searched from the databases 1450 – 1475 in step S1925. The automatic bid seller information includes auction information of sellers, which have an ID number assigned when connected with the reverse auction server 1300. Accordingly, the information of seller A is read at this time.

The reverse auction automatic bid module 1425 then searches automatic bid conditions established by seller A using seller A information in step S1930. The automatic bid conditions includes the low price and the high price. Next, a new bid of seller A is determined from the last bid of seller B in step S1935. At this time, it is possible for the new bid of seller A to be a predetermined amount below a start price that has been automatically increased. The predetermined amount can be designated by the seller, or can be an amount pre-set in the reverse auction server 1300.

The reverse auction automatic bid module 1425 then determines if the new bid can be made in step S1940. That is, it is determined if by lowering the last bid by the predetermined amount to automatically generate the new bid, the new bid falls within the range of the low price and the high price set by seller A. It is determined that the new bid cannot be placed in
step S1940 if it falls outside the scope designated by the seller.

In step S1940, if it is determined that the new bid can not be placed, seller A is notified that the operation of the reverse auction automatic bid module 1425 is completed in step S1945. This is realized through the seller interface 1310 used by seller A. However, if it is determined that the new bid can be placed in step S1940, step S1865 of establishing a bid is performed.

FIG. 20 shows a flow chart of operations performed by the reverse auction automatic price increase module 1430.

If a buyer generates an auction, the reverse auction generation module 1415 initializes the databases 1450 – 1475 with regard to auction particulars in step S1750. The reverse auction automatic price increase module 1430 then searches the databases to extract automatic price increase variables for the auction in progress such that variables needed for the operation of the reverse auction automatic price increase module 1430 can be calculated in step S2010. The extracted variables include auction participants, an auction generation price QO, a total auction time SQ, and a mis-bid price QX. From these extracted variables, the reverse auction automatic price increase module 1430 calculates variables needed for operation such as an automatic price increase time SU, an automatic price increase cycle DS, a number of automatic price increases NN, and a minimum start price QU.

The auction generation price QO and the mis-bid price QX are input by a buyer when generating an auction such that they are stored in the databases. The auction participants and the total auction time SQ are recorded in the databases and are determined from the time of auction generation. The automatic price increase time SU is based on the total auction time SQ. The automatic price increase time SU can be established by calling the random number generator 1485. It is preferable that the automatic price increase time SU is between 40% and 60% of the total auction time SQ.

The automatic price increase cycle DS is a cycle through which the
reverse auction automatic price increase module 1430 operates, and can be established randomly. The automatic price increase cycle DS is established by calling the random number generator 1485. It is preferable that the automatic price increase cycle DS is within 10% of the automatic price increase time SU. The number of automatic price increases NN determines a total number of operations of the reverse auction automatic price increase module 1430. The number of automatic price increases NN can be calculated by dividing the automatic price increase time SU by the automatic price increase cycle DS to a predetermined number of decimal places.

The maximum start price QU is a variable established so that the reverse auction automatic price increase module 1430 does not increase an auction start price Q above a certain value, that is, the maximum start price QU. The maximum start price QU is established by calling the random number generator 1485.

Subsequently in step S2015, the reverse auction automatic price increase module 1430 remains on stand-by for the duration of the automatic price increase cycle DS. After the automatic price increase cycle DS, it is determined if there is a registered bid in step S2020. If there is a registered bid, the reverse auction automatic price increase module 1430 discontinues its operation in step S2025.

However, if there is no registered bid in step S2020, the auction start price Q is increased by an increase price DQ in step S2030. The increase price DQ can be increased every time the reverse auction automatic price increase module 1430 operates, or can be increased by establishing a variation model with predetermined conditions.

The remaining steps of FIG. 20 (i.e., of the reverse auction automatic price increase module 1430) will described hereinafter.

FIG. 21 shows an example of a variation model used for the reverse auction automatic price increase module 1430.

In the graph of FIG. 21, a horizontal axis represents time and a vertical axis represents price. At the beginning of an auction, the auction is
started with the auction generation price Q0, and the auction start price Q is set as the auction generation price Q0. It is determined if there is a bid every automatic price increase cycle, and if there is a bid, the auction is started with the auction start price Q from the time of the bid. If there is no bid, the auction start price Q is increased by a predetermined amount (i.e., the amount DQ).

The increase in price DQ can be varied every time it is implemented. That is, a stand-by difference price QQ in which the maximum start price QU is subtracted from the auction start price Q can be used as a variable in the variation model. Even with continued increases in the auction start price, the increases do not result in a price higher than the maximum start price QU.

FIG. 22 is a flow chart of a price increase determination process according to a second preferred embodiment of the present invention.

First, it is determined if the number of automatic price increases NN is less than or equal to zero in step S2210. If this condition is not met, no more increases are made and the process is discontinued. However, if this condition is met, the increase price is first calculated using equation 4 below in step S2215.

[Equation 1]

\[ DP = \text{truncate} \left( \frac{QQ}{NN} \right) \]

where QQ is the stand-by difference price calculated by subtracting the maximum start price QU from the auction start price Q, NN is the number of automatic price increases, and truncate is the number of decimal places to which the calculation is made.

Next, in step S2220, a random variable b is established, and a random value is set as "b" based on the DQ value stored in step S2215. It is possible for the "b" value to be established by the random number generator 1485, and it is preferable for the "b" value to be within 50% of the DQ value.

After the "b" value is established, a sign of the "b" value is randomly designated as positive or negative in step S2225. The sign can be designated by the random number generator 1485. By randomly designating
the sign of the "b" value, the increase price DQ is randomly set when the price is automatically increased such that the sellers can not forecast what the increase price DQ will be.

Next, the increase price DQ is revised using equation 5 below in step S2230.

[Equation 5]
DQ = truncate (DQ + b)

After the increase price DQ is revised, the number of automatic price increases NN, the stand-by difference price QQ, and the auction start price Q are revised using equation 6 below in step S2235.

[Equation 6]
NN = NN - 1
QQ = QQ - DQ
Q = Q - DQ

By step S2235, the stand-by difference price QQ is reduced in accordance with the accumulation of the number of automatic price increases NN, and the number of automatic price increases NN is reduced by the number of times the reverse auction automatic price increase module 1430 has operated.

Referring back to FIG. 20, since the stand-by difference price QQ is reduced in step S2235, step S2030 of increasing the auction start price Q by the forward auction automatic price increase module 1430 is completed. Next, it is determined if the auction start price Q is greater than the maximum start price QU in step S2035.

If the auction start price Q is greater than the maximum start price QU, a mis-bid warning message is transmitted in step S2045 and the operation of the reverse auction automatic price increase module 1430 is discontinued. The mis-bid warning message is transmitted to all sellers and buyers involved in the present auction. However, if the auction start price Q has not reached the maximum start price QU, it is determined if the amount of time used for automatic price increase has exceeded the automatic price
increase time SU in step S2040.

If the time has exceeded the automatic price increase time SU, step S2045 of transmitting the mis-bid warning message is performed and the operation of the reverse auction automatic price increase module 1430 is ended. However, if the time has not exceeded the automatic price increase time SU, the increased auction start price \( Q \) is registered in the databases in step S2050. The process is then returned to step S2015.

FIG. 23 shows a flow chart of operations performed by the reverse auction successful bidder selection module 1435.

If a buyer generates an auction, the reverse auction generation module 1415 initializes the databases with respect to data related to the generation of auctions in step S1750. The reverse auction successful bidder selection module 1435 then determines if there is a bid registration in step S2310. If there is no bid registration, the reverse auction automatic price increase module 1430 is operated. However, if there is a bid registration, a time elapsed since the most recent bid time is calculated in step S2315.

Subsequently, it is determined if the elapsed time is greater than a predetermined time in step S2320. The predetermined time can be set as needed and is five minutes in the second preferred embodiment of the present invention. If the elapsed time is greater than the predetermined time, the most recent bidder is selected as the successful bidder in step S2325.

If the elapsed time is not greater than the predetermined time, it is then determined if an auction end time has been reached in step S2330. The auction end time is calculated by adding a time for generating an auction to a total auction time. Step S2330 is also performed after the reverse auction automatic price increase module 1430 is operated in the case where there is no bid in step S2310 of determining if there is a bid registration.

In step S2330, if it is determined that the auction end time has not been reached step S2310 is performed. However, if it is determined that the auction end time has been reached, step S2335 is performed. If there is no bid registration in step S2335, it is determined that there has been a mis-bid
and the operation of the reverse auction successful bidder selection module 1435 is ended in step S2340. If there is a bid registration in step S2335, the seller with the lowest bid is selected as the successful bidder by the reverse auction successful bidder selection module 1435 in step S2345.

FIG. 24 shows a flow chart of operations performed by the reverse auction successful bidder reporting module 1440.

If the operation of the reverse auction successful bidder selection module 1435 is ended in step S2400, the reverse auction successful bidder selection module 1435 provides auction information to the reverse auction successful bidder reporting module 1440 such that the reverse auction successful bidder reporting module 1440 is operated. The reverse auction successful bidder reporting module 1440 searches buyer information from the databases in step S2405. It is possible to for the buyer information to include an email address of the seller.

The reverse auction successful bidder reporting module 1440 determines if there is a successful bidder from the auction information received from the reverse auction successful bidder selection module 1435 in step S2410. If there is no successful bidder, the buyer is notified of a mis-bid in step S2415 and the auction is ended. However, if there is a successful bidder in step S2410, auction results including buyer information are transmitted to the buyer in step S2420. Next, successful bid information is transmitted to the successful bidder in step S2425 and the auction is ended.

Although preferred embodiments of the present invention have been described in detail hereinabove, it should be clearly understood that many variations and/or modifications of the basic inventive concepts herein taught which may appear to those skilled in the present art will still fall within the spirit and scope of the present invention, as defined in the appended claims.
WHAT IS CLAIMED IS:

1. In an auction system comprising an auction server for performing auction procedures, with at least one buyer interface connected to an auction server and at least one seller interface connected to the auction server, a method for conducting an auction using a computer network, the method comprising the steps of:

   (1) receiving input of auction start information by the auction server, such as an auction start price from a seller;
   (2) transferring, by the auction server, the auction start information to the buyer interface;
   (3) reducing the auction start price by a predetermined amount if a bid is not made by a buyer for a predetermined time;
   (4) receiving bid information from buyers by the auction server; and
   (5) selecting a successful bidder by the auction server.

2. The method of claim 1 wherein step (3) is repeatedly performed

3. The method of claim 1 wherein in step (3), the predetermined amount is a value randomly determined by the auction server.

4. The method of claim 2 wherein the predetermined amount is a value randomly determined by the auction server every time step (3) is performed.

5. The method of claim 2 wherein the auction start price is not reduced below a predetermined price.

6. In an auction system comprising an auction server for performing auction procedures, with at least one buyer interface connected to the auction server and at least one seller interface connected to the auction server, a method for conducting an auction using a computer network, the method comprising the steps of:

   (6) receiving input of auction start information by the auction server, such as an auction start price from a buyer;
   (7) transferring, by the auction server, the auction start information to the seller interface;
(8) increasing the auction start price by a predetermined amount if a bid is not made by a seller for a predetermined time;

(9) receiving bid information from sellers by the auction server; and

(10) selecting a successful bidder by the auction server.

7. The method of claim 6 wherein step (8) is repeatedly performed

8. The method of claim 1 wherein in step (8), the predetermined amount is a value randomly determined by the auction server.

9. The method of claim 7 wherein the predetermined amount is a value randomly determined by the auction server every time step (8) is performed.

10. The method of claim 7 wherein the auction start price is not increased above a predetermined price.

11. In an auction system comprising an auction server for performing auction procedures, with at least one buyer interface connected to the auction server and at least one seller interface connected to the auction server, a method for conducting an auction using a computer network, the method comprising the steps of:

   (11) receiving input of auction start information by the auction server, such as an auction start price from a seller;

   (12) transferring, by the auction server, the auction start information to the buyer interface;

   (13) receiving bid information such as bid prices from buyers by the auction server;

   (14) selecting a successful bidder by the auction server; and

   (15) reporting by the auction server the successful bidder,

   wherein a low price and a high price is also included in the bid information received from the buyers in step (13), and bid prices are automatically established if a predetermined condition is satisfied, the bid prices being automatically established using automatic bid prices calculated using a predetermined process.

12. The method of claim 11 wherein the predetermined condition
includes a subsequent bid price, determined by adding a first predetermined amount to another buyer’s most recent bid price after receiving bid information from the other buyer, falling within a range set by the low price and high price, and wherein the predetermined process is a process by which a second predetermined amount is added to another buyer’s most recent bid price.

13. The method of claim 11 further comprising the step of (17) reducing the auction start price by a third predetermined amount if a bid is not made by a buyer for a predetermined time.

14. The method of claim 13 wherein step (17) is repeatedly performed.

15. The method of claims 13 or 14 wherein if the auction start price is reduced below the low price, a price obtained by adding a fourth predetermined amount to the auction start price is determined to fall within the high price and the low price, and the predetermined process for automatically establishing bid prices is a process by which a fifth predetermined amount is added to the reduced auction start price.

16. In an auction system comprising an auction server for performing auction procedures, with at least one buyer interface connected to the auction server and at least one seller interface connected to the auction server, a method for conducting an auction using a computer network, the method comprising the steps of:

(18) receiving input of auction start information by the auction server such as an auction start price from a buyer;

(19) transferring, by the auction server, the auction start information to the seller interface;

(20) receiving bid information such as bid prices from sellers by the auction server;

(21) selecting a successful bidder by the auction server; and

(22) reporting by the auction server the successful bidder, wherein a low price and a high price is also included in the bid
information received from the sellers in step (20), and bid prices are automatically established if a predetermined condition is satisfied, the bid prices being automatically established using automatic bid prices calculated using a predetermined process.

17. The method of claim 16 wherein the predetermined condition includes a subsequent bid price, determined by subtracting a sixth predetermined amount from another seller’s most recent bid price after receiving bid information from the other seller, falling within a range set by the low price and high price, and wherein the predetermined process is a process by which a seventh predetermined amount is added to another seller’s most recent bid price.

18. The method of claim 16 further comprising the step of (24) increasing the auction start price by an eighth predetermined amount if a bid is not made by a seller for a predetermined time.

19. The method of claim 18 wherein step (24) is repeatedly performed.

20. The method of claims 18 or 19 wherein if the auction start price is increased above the high price, a price obtained by adding a ninth predetermined amount to the auction start price is determined to fall within the high price and the low price, and the predetermined process for automatically establishing bid prices is a process by which a tenth predetermined amount is subtracted from the increased auction start price.

21. An auction system comprising:
    an auction server for performing auction procedures;
    at least one buyer interface connected to the auction server;
    at least one seller interface connected to the auction server;
    an auction bid module receiving input of bid information including bid prices from buyers; and
    an automatic price reduction module for automatically decreasing an auction bid price if a bid is not made by a buyer for a predetermined time.

22. The auction system of claim 21 further comprising an automatic
bid module for automatically establishing bid prices by increasing a bid made by another buyer by a predetermined amount.

23. An auction system comprising:

an auction server for performing auction procedures;

5 at least one buyer interface connected to the auction server;

at least one seller interface connected to the auction server;

an auction bid module receiving input of bid information including bid prices from sellers; and

an automatic price increase module for automatically increasing an auction bid price if a bid is not made by a seller for a predetermined time.

24. The auction system of claim 23 further comprising an automatic bid module for automatically establishing bid prices by decreasing a bid made by another seller by a predetermined amount.
Fig. 1

110 Buyer interface
   ↓
   Data converter
   120

110 Buyer interface
   ↓
   Data converter
   120

110 Buyer interface
   ↓
   Data converter
   120

Forward auction server
  100

Data converter
  130

Seller interface
  140
Fig. 3

310 - Reference the forward auction details
320 - Generate forward auction
330 - Reduce start price
340 - Make bids
350 - Automatic bids
360 - Select successful bidder
370 - Reports successful bidder
Fig. 4

Buyer

410
Connect with forward auction server

411
Select forward auction reference module

412
Select auction item

413
Check auction list

414
Request detailed information

415
Check detailed information

Forward auction reference module

430
Enable selection of auction items

431
Search auction history of selected item

432
Generate auction list and provide to buyers and seller

433
Search detailed information

434
Provide detailed information to buyers and seller

435
Check detailed information

Seller

420
Connect with forward auction server

421
Select forward auction reference module

422
Select auction item

423
Check auction list

424
Request detailed information

425
Check detailed information
Fig. 5

Seller

505 Select forward auction generation module

515 Select auction item

525 Make selections

540 Seller verification

Forward auction generation module

510 Enable selection of auction items

520 Provide format for selection of detailed auction information

530 Input information correct?

No

Yes

535 Transmit detailed auction information

545 Generate auction

550 Initialize databases
Fig. 6

Buyer

610 Reference auction information

615 Select item for purchase

620 Request auction history information?

Yes

625 Search auction history information

630 Transmit auction history information

No

635 Check auction history information

640 Determine bid price

645 Request for bid

650 Provide bid electronic document

660 Input information correct?

Yes

665 Establish bid

no

Initialize databases

655 Input particulars and transmit document
Fig. 7

Buyer

670
Register automatic bidding

715
Condition satisfied

Forward auction automatic bid module

710
Stand-by until condition satisfied

720
Automatic bid history exists?

No

Yes

725
Search automatic bid history

730
Search automatic bid conditions

735
Determine new bid

740
New bid acceptable?

Yes

665
Establish bid

No

745
Notify completion of automatic bid process
Fig. 8

Forward auction generation module

550

Initializes databases

Forward auction automatic price reduction module

Calculate variables 810

Stand-by 815

Registered bid? Yes

No

Reduce auction start price 835

Auction start price < minimum start price? Yes

No

Exceed automatic price reduction time? Yes

No

Initialize databases 850

Transmit warning message 845

Discontinue operation 825
Fig. 9

Fig. 10

Start

1010

N ≤ 0?

Yes

No

1015

DP = truncate (PP/N)

1020

Designate random value a

1025

Designate sign of value a

1030

DP = truncate (DP + a)

1035

N = N - 1

PP = PP - DP

P = P - DP

End
Fig. 11

1. Forward auction generation module
   550
   - Initialize databases after generation of auction
   - Execute automatic price reduction module

2. Forward auction successful bidder selection module
   1110
   - Bid registration?
     - Yes
       - Time elapsed since most recent bid time
         - Yes
           - Elapsed time > 5 minutes?
             - Yes
               - Auction end time reached?
                 - Yes
                   - Select most recent bidder as successful bidder
                     - End
                 - No
                   - Bid registration exists?
                     - Yes
                       - Select buyer with highest bid as successful
                         - End
                     - No
                       - Mis-bid
                         - End
             - No
               - Auction end time reached?
                 - Yes
                   - Select most recent bidder as successful bidder
                     - End
                 - No
                   - Bid registration exists?
                     - Yes
                       - Select buyer with highest bid as successful
                         - End
                     - No
                       - End
**Fig. 12**

Forward auction successful bidder reporting module

End operation of forward auction successful bidder selection module

1200

Search seller information from databases

1205

Successful bidder?

1210

No

Notify seller of mis-bid

1215

End

Transmit successful bid information to successful bidder

1225

End

Transmit auction results to seller

1220
Fig. 13

1310 Seller interface
1320 Data converter
1320 Data converter
1320 Data converter
1300 Reverse auction server
1330 Data converter
1340 Buyer interface
Fig. 14
Fig. 15

1510 Reference the reverse auction details
1520 Generate reverse auction
1530 Increase start price
1540 Make bids, Automatic bids
1550
1560 Select successful bidder
1570 Reports successful bidder
Fig. 16

1610 Buyer

1611 Connect with reverse auction server

1612 Select auction item

1613 Check auction list

1614 Request detailed information

1615 Check detailed information

1616 Reverse auction reference module

1620 Seller

1621 Connect with reverse auction server

1622 Select auction item

1623 Check auction list

1624 Request detailed information

1625 Check detailed information

1630 Enable selection of auction items

1631 Search auction history of selected item

1632 Generate auction list and provide to buyer and seller

1633 Search detailed information

1634 Provide detailed information to buyers and seller
Fig. 17

Buyer

1705 Select reverse auction generation module
1715 Select auction item
1725 Make selections
1740 Seller verification

Reverse auction generation module

1710 Enable selection of auction items
1720 Provide format for selection of detailed auction information
1730 Input information correct?
1735 Yes
1735 Transmit detailed auction information

1745 No
1745 Generate auction
1750 Initialize databases
Fig. 19

Seller

1870
Register automatic bidding

1915
Condition satisfied

Reverse auction automatic bid module

1910
Stand-by until condition satisfied

1920
Automatic bid history exists?

No

Yes

1925
Search automatic bid history

1930
Search automatic bid conditions

1935
Determine new bid

1940
New bid acceptable?

Yes

1965
Establish bid

No

1945
Notify completion of automatic bid process
Fig. 20

Reverse auction generation module

1750

Reverse auction automatic price increase module

Initializes databases

Calculate variables 2010

Stand-by 2015

Registered bid? Yes

No

Increase auction start price 2035

Auction start price > minimum start price? Yes

No

Exceed automatic price increase time? Yes

No

2050

Initialize databases

2025 Discontinue operation

2020

2040

2045
Fig. 21

Fig. 22

Start

2210

2215

DQ = truncate (QQ/NN)

2220

Designate random value b

2225

Designate sign of value b

2230

DQ = truncate (DQ + b)

2235

NN = NN - 1
QQ = QQ - DQ
Q = Q - DQ

End

NN ≤ 0?

No

Yes
Fig. 23

Reverse auction generation module

2350 Initialize databases after generation of auction

Execute automatic price increase module

Reverse auction successful bidder selection module

2310 Bid registration?
   Yes
   Time elapsed since most recent bid time
   2315
   Yes
   Elapsed time > 5 minutes?
   No
   No
   Auction end time reached?
   No
   2330
   Yes
   Select most recent bidder as successful bidder
   2335
   No
   Bid registration exists?
   Yes
   Select seller with lowest bid as successful

2310
   No
   2320
   Elapsed time > 5 minutes?
   No
   2330
   Yes
   No
   Bid registration exists?
   Yes
   Select seller with lowest bid as successful

End

Mis-bid
End

End
Fig. 24

Reverse auction successful bidder selection module

End operation of forward auction successful bidder selection module

2400

Reverse auction successful bidder reporting module

Search seller information from databases 2405

Successful bidder? 2410

Yes 2420

Transmit auction results to buyer

End 2425

No 2415

Notify buyer of mis-bid

End