

METHOD AND APPARATUS FOR AUTOMATIC REDIALING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus and a method for automatic redialing, and more particularly, to a method for storing the telephone numbers and the time sequence (time interval) of dialed numbers into the memory. Furthermore, the telephone numbers with the stored sequence are redialed automatically to improve the probability of a successful dial.

2. Description of the Prior Art

Currently, the apparatus and the method for redialing function on communication equipments, such as telephone, fax etc., simply store the telephone numbers into the memory. Therefore, while pressing the redialing key, the communication equipment merely retrieves the telephone number from the memory and dials out. However, the method ignores the time sequence of dialed numbers, and usually fails in dialing, for example, in making a long distance call, dialing out from an extension telephone set, dialing out to an external extension, keying in security code before dialing etc. As shown in Fig. 4, the conventional redialing method with the same time sequence and the

artificial dialing method with different time sequence. Due to the dialed telephone numbers can't match completely with the time sequence, it usually leads to the failure of redialing.

SUMMARY OF THE INVENTION

The object of the present invention is to improve the conventional redialing method by storing the dialed numbers and the time sequence simultaneously for assuring it can match with the artificial dialing completely to redial successfully .

The object of the invention is fulfilled by providing an apparatus and a method for automatic redialing by storing the dialed numbers and the time sequence simultaneously. The apparatus comprises : a timer for recording a time sequence of a plurality of telephone numbers, a read-only memory (ROM) for storing a program, a microprocessor for controlling the whole operation flow by executing the program, a random access memory (RAM) for storing and retrieving the dialed telephone numbers and the time sequence, and a telephone interface which consists of a dialing keyboard, a automatic redialing key, and a telephone receiver, wherein the dialing keyboard is utilized as dialing function when it is dialed by the user, the automatic redialing key is utilized as redialing function when it is dialed by the user, and telephone receiver is utilized as communicating function when it is picked up by the user.

The timer of the present invention provides recording function for the time

sequence. When one user dials one key, the timer records current time, and when the user dials next key, the timer will calculates the time interval of twice dialing number and stores it into memory. In accordance with the method, the user can record all the dialed telephone numbers and the time sequence. While redialing, the present invention can match with the artificial dialing completely on the dialed telephone numbers and the time sequence to redial successfully.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood by the detailed description given hereinafter with reference to the accompanied drawings which are given by way of illustration, and are unlimitative of the present invention.

Fig.1.shows the diagram of the automatic redialing according to the present invention.

Fig.2. shows the diagram of the telephone interface shown in Fig.1.

Fig.3. shows the address relative charts of random access memory(RAM) shown in Fig.1.

Fig.4. shows the comparative charts about the time sequence of the artificial dialing, the conventional redialing, and the present invention.

Fig.5. shows the flow charts of the present invention by pressing the dialing keyboard to

dial out and store the dialed telephone numbers and the time sequence.

Fig.6. shows the flow charts of the present invention by pressing the automatic redail key to dial out the dialed telephone numbers and the time sequence.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the present invention will now be described with reference to the accompanied drawings.

As illustrated in Fig.1, microprocessor 13, ROM 15, RAM 11, power(unshown in the figure)etc. are simple and necessary computer elements combined with timer 12 and telephone interface 14 to become an automatic redailing apparatus of the present invention.

As illustrated in Fig.2, the telephone interface consists of a telephone receiver 141, a dialing keyboard 142, and a smart redailing key 143. The telephone interface 14, compared with the ordinary telephone interface, merely adds a automatic redialing key 143 to perform the redailing function.

As illustrated in Fig.3, the user dials a series of the dialed telephone numbers which are "D1,D2,...Dn", and a series of the time sequence which are "T1,T2,...Tn-1". Referring to Fig.1, the user presses the dialing key in the dialing keyboard 143 as shown

in Fig.2, which is the first number D1, then microprocessor 13 controls the whole apparatus by executing the program in ROM 15 and dials out D1, and then stores D1 into the number region of RAM 11, and at the same time starts the timer 12. The user presses the dialing key which is the second number D2, microprocessor 13 dials out D2, then it stores D2 into the number region of RAM 11, and takes out the time of the timer 12 to define it for T1, and stores T1 into the time region of RAM 11. Then, restarting the timer 12. Continuously, the user presses the dialing key which is the nth number Dn, Dn will be dialed out and stored into the number region of RAM 11, and microprocessor 13 takes out the time of the timer 12 to define it for Tn-1, stores Tn-1 into the time region of RAM 11, and closes the timer 12. As stated above, the contents in the number region of RAM 11 are "D1,D2,...Dn", and the contents in the time region of RAM 11 are "T1,T2,...Tn-1".

Referring to Fig.1 again, the user presses the automatic redialing key 143 as shown in Fig. 2. The microprocessor 13 controls the whole apparatus by executing the program in ROM 15, it takes out the first dialed number "D1" from RAM 11, dials out D1, at the same time, it takes out the first time sequence "T1" from RAM 11, and then it setups the time of the timer 12 to be T1, and starts the timer 12. When the time of the timer 12 is over, the microprocessor 13 takes out the second dialed telephone number "D2" from RAM 11, and then it dials out D2, at the same time, it takes out the second time sequence "T2" from RAM 11, setups the time of the timer 12 to be T2, and then restarts the timer 12. Continuously, when the (n-1)th time comes, the microprocessor 13 takes out the nth number "Dn" from RAM 11 and dials out Dn, and then it closes the timer 12. As stated above, when the user presses the automatic redialing key 143, the series of the

dialed telephone numbers " $D_1, D_2, \dots, D_n$ " will be redialed out in order in to be accordance with the series of the time sequence " $T_1, T_2, \dots, T_{n-1}$ ".

When the user dials another series of the dialed telephone numbers, the number region of RAM 11 and the time region of RAM 11 will be replaced by a new series of the dialed telephone numbers and a new series of the time sequence, and then the user presses the automatic redial key 143, the new series of the dialed telephone numbers will be redialed out in order to be in accordance with the new series of the time sequence, so as to assure the success of redialing every time.

As illustrated in Fig.4, it is an example for connecting to an extension from a switchboard, it needs an accurate time sequence(time interval), and if the time sequence is too long or too short, it usually leads to the failure of redialing. Assuming the numbers of the switchboard is " $D_1, D_2, \dots, D_i$ " and the numbers of the extension is " $D_{i+1}, \dots, D_n$ ", and the series of the time sequence of the artificial dialing is " $T_1, T_2, \dots, T_i, \dots, T_{n-1}$ ", wherein T_i is the time sequence of the switchboard changing to the extension. The series of the time sequence of the automatic redialing is also " $T_1, T_2, \dots, T_i, \dots, T_{n-1}$ " and it is the same with the time sequence of the artificial dialing, therefore, the present invention can assure the successful redialing. However, the conventional redialing is different with the artificial dialing in the time sequence " T_i ", when the switchboard changes to the extension, therefore, the series of the time sequence can't match with each other between the artificial dialing and the conventional redialing ,so as to the conventional redialing will lead to the failure of redialing.

As illustrated in Fig.5, it shows the flow charts of the present invention by pressing the dialing keyboard to dial out and store the dialed telephone numbers and the time sequence, wherein "i" is the counter value, "n" is the total times of dialing, "Di" is the ith dial number, "otime" is a time value of previous dialed number, "ctime" is a time value of current dialed number, and "Ti-1" is the time sequence between "otime" and "ctime". The program starts at step 501 by pressing a dialing key. Next, at decision step 502, the program checks if the dialing key is the first dialing key. If the dialing key is the first dialing key, YES branch is taken to step 503 where the program initializes the counter value for "i=1", then, does the step 504. Otherwise, if not, NO branch is jumping to step 504. At the step 504, the program gives the dialed telephone number to Di, next, stores directly the dialed telephone number into the number region of RAM 11 at step 513. Next, the program dials out the number at step 505 and at decision step 506 it checks if the dialing key is the first dialing key in line. If YES, YES branch is taken to step 507 where the program gives the current time to "otime", and then does the step 511. Otherwise, if not, NO branch is jumping to step 508 where the program gives the current time to "ctime" and at step 509 it takes out the difference between "ctime" and "otime", defines the difference to "Ti-1". Moreover, the program stores Ti-1 into the time region of RAM 11 at step 514. Next, the program is jumping to step 510 where it gives "ctime" to "otime". Furthermore, at step 511 where the program gives "i" to "n" and then it adds the counter value "i" for "i=i+1". Now, the program completes once artificial dialing process, and it is continuing the stated above steps until finishing the artificial dialing.

As illustrated in Fig.6, it shows the flow charts of the present invention by pressing

the automatic redialing key to dial out the dialed telephone numbers and the time sequence. The program starts at step 601 by pressing the automatic redialing key. At step 602, the program initializes the counter value for "i=1". Next, at decision step 603, the program checks if there is any number to redialed out, namely, it judges if the counter value "i" is smaller than or equal to the total times of dialing "n". If not, No branch is taken to the end of program process, where it indicates there isn't any telephone number to be redialed out. Otherwise, if yes, YES branch is taken to step 604 where the program retrieves the number "Di" from the number region of RAM 11 at step 610, and then it redials out the number Di. Next, at decision step 605, the program checks if the number is the last redialing number, namely, it judges if "i" is equal to "n". If the answer is yes, YES branch is taken to the end of program process. Otherwise, if the answer is not, NO branch is taken to step 606 where the program retrieves the time sequence "Ti" from the time region of RAM 11 at step 611, and then it starts the timer to set the time for "Ti". Next, at step 607, the program adds the counter value "i" for "i=i+1". Now, the program completes once redialing process. When the time "Ti" of the timer is over, the timer interrupts into the program, and then the program is taken back to step 603. Continuing the stated above steps until step 603 is unsatisfied and the automatic redialing is finished.

Although specific embodiments have been illustrated and described, it will be obvious to those skilled in the art that various modification may be made without departing from the spirit which is intended to be limited solely by the appended claims.



CLAIMS

What is claimed is:

1. Apparatus for performing redialing, comprising:

timer means for recording a time sequence of a plurality of telephone numbers;

a read-only memory (ROM) for storing a program;

a microprocessor for controlling said apparatus by executing said program;

a random access memory (RAM) for storing and retrieving the telephone numbers and the time sequence; and

telephone interface means for communicating said microprocessor and a user, and wherein the telephone interface means at least comprises automatic redialing key means for performing redialing function by the user .

2. Apparatus of claim 1, wherein said telephone interface means further comprises:

dialing keyboard means for performing dialing function by the user;

telephone receiver means for communicating function when it is picked up by the user.

3. Apparatus for performing redialing, comprising:

timer means for recording a time sequence of a plurality of telephone numbers;

a read-only memory (ROM) for storing a program;

a microprocessor for controlling said apparatus by executing said program;

a random access memory (RAM) for storing and retrieving the telephone numbers and the time sequence;



dialing keyboard means for performing dialing function by the user;
automatic redialing key means for performing redialing function by the user; and
telephone receiver means for communicating function when it is picked up by the user.

4. A method for performing automatic redialing by pressing a dialing keyboard to dial out and store the dialed telephone numbers and the time sequence, said method comprising the steps of:

pressing a dialing key on said dialing keyboard to generate a dialed telephone number;

determining whether said dialing key is the firstly pressed;

storing said dialed telephone number into a RAM;

dialing out said dialed telephone number; and

storing said time sequence of the dialed telephone number into said RAM.

5. The method of claim 4, after the determining step, further comprising a step of initializing a counter value when the dialed telephone number is firstly pressed.

6. The method of claim 4, after the determining step, further comprising a step of setting current time to a time value of previous dialed number when the dialed telephone number is firstly pressed.

7. The method of claim 4, after the determining step, when the dialed telephone number isn't firstly pressed, further comprising the steps of:



setting current time to a time value of current dialed number;
generating a difference between said time value of current dialed number and a time value of previous dialed number;
storing said difference into said RAM; and
setting said time value of dialed current number to said time value of previous dialed number.

8. The method of claim 7, further comprising the steps of:

setting a number counter value to a total value, said total value representing the total times of previous dialing; and
incrementing said number counter value.

9. A method for performing automatic redialing by pressing the redailing key to dial out the dialed telephone numbers and the time sequence, said method comprising the steps of:

pressing a redialing key;
initializing a number counter value;
retrieving a dialed telephone number form a RAM when there is any dialed telephone number to be redialed.
redialing out said dialed telephone number;
determining whether said dialed telephone number is the last number by said number counter value and a total value that represents the total times of previous dialing;
retrieving a time sequence of said dialed telephone number form said RAM; and
repeating the retrieving number step, the redialing out number step, the determining



step, and the retrieving time sequence step until finish redialing.

10. The method of claim 9, after the retrieving time sequence step, further comprising the steps of:

setting a time of a timer;

incrementing said number counter value; and

timer interrupting when time arrives said time of said timer.