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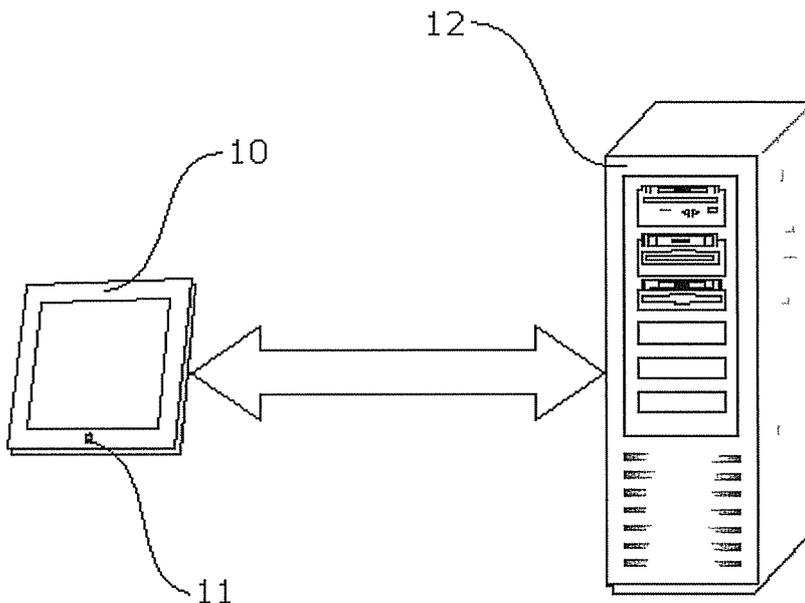
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(54) **Title:** METHOD AND APPARATUS FOR SECURE INSERTION OF AN ACCESS CODE USING AN EYE TRACKING DEVICE



(57) **Abstract:** The present invention concerns a method and an apparatus for the secure insertion of a code, using an eye controlled interface, in order to access to any protected application. Besides the present invention allows the user to interface with eye tracking systems and devices that enable him to use only his own gaze rather than the usual user interface like keyboards, mouse, etc. increasing, in such way, the security level of said code insertion.

WO 2007/017500 A1

METHOD AND APPARATUS FOR SECURE INSERTION OF AN ACCESS CODE
USING AN EYE-TRACKING DEVICE

Field of the invention

The present invention concerns the field of the authentication of the individual
5 identity during the procedure of access to a determined system or to a determined
protected resource. The apparatus and the method according to the present
invention are used in the field of the security systems in order to manage, protect
and control conditional access resources, particularly through the password use.

State of the art

10 In these last years, in the field of computer science, the necessity to increase the
security measures to protect the access to reserved and sensitive data, so that
only authenticated and qualified users has access, has taken a great importance.

For instance with the proliferation of the cash points, the automated teller
machines and other automatic equipments of this type, today different devices of
15 authentication that use magnetic cards or microprocessor and password are used
on large scale.

At the ATM points for banking transactions whoever in possession of an ATM card
and aware of the corresponding personal identification number (PIN) is allowed to
access to the corresponding bank account to withdraw or to transfer money.

20 The simple passwords or also the security magnetic cards that are normally used
to authenticate the users introduce the drawback that they can be lost, stolen and
cloned so that whoever improperly takes possession of these could access to sure
areas.

In banks and in other societies of services is an extremely important problem to
25 establish the clients identity, in other words the authentication; the correct
authentication, in fact, is required to protect themselves against any attempt of
possible swindler to access the account of another person.

Therefore it is clear the necessity of security measures that are not easily
susceptible of violation and duplication.

30 One of the most used and simple methods to provide access to computer
systems, to secure areas, to financial transaction systems, etc. is characterized by
the insertion of a password using a keyboard to which is often associated a

display.

A standard method for the insertion of an alphanumeric password, for instance, consists in typing the password on a standard ASCII keyboard or a numerical keyboard.

- 5 The user password is not directly displayed on the screen but an asterisk or another character is shown as feedback to every character inserted to confirm the occurred typing.

Nevertheless, in many systems it is possible, for a not authorized observer, to see or to film the sequence of the code insertion in order to steal it.

- 10 Frequent changes of the password used by the authorized user can prevent this possibility, but despite this changes a not authorized user can still access to different systems before the password is changed. Moreover, in systems like the Automatic Teller Machine (ATM), the user password or the secret code cannot be easily changed.

- 15 For these reasons, it is extremely important that the passwords and the methods of code and password insertion are secure regarding the possible identification from third persons.

Therefore, the purpose of the present invention is to realize a method and an apparatus that allow the secure insertion of password to a conditioned access
20 application / system, erasing the possibility of code theft through direct observation or video recording of code typing.

The method and the apparatus according to the present invention allow the code/password insertion without the use of the user hands but only with his gaze, using an eye-tracking device.

25 **Summary of the invention**

The object of the present invention is a method and an apparatus for the secure insertion of password or access codes to protected areas and contents protected as described in the claims that compose the integral part of the present description.

30 **Brief description of the figures**

Fig. 1 shows a block diagram of a preferred embodiment of the present invention.

Fig. 2 shows the flow chart of the method according to the present invention.

Fig. 3 shows the flow chart regarding the routine of raw data filtering upcoming from the eye - tracker device.

Fig. 4 shows the flow chart regarding the routine of optical command determination corresponding to the data upcoming from the eye-tracker device.

5 **Detailed description of the invention**

The apparatus, object of the present invention, includes: means of visualization of graphical images or text, means of survey of the gaze coordinates of the user turned to these visualization means, means of processing of the data produced by means of survey of the user gaze coordinates, means of interfacing with the security systems that regulate the access to the areas protected by password.

Said means of produced data processing include means of data filtering, means of identification of the activated areas - on said means of visualization of graphical images or text - by the user gaze, means of activation of the components belonging to said active areas, means of dispatch, to said means of visualization, of feedback corresponding to the determined action, means of generating a password corresponding to the determined action and means of dispatch, to said means that generate the interface with the security systems, of said password.

In a preferred embodiment of the present invention, described in Fig. 1, said means of images visualization include at least a monitor 10, said means of survey of the user gaze coordinates comprise at least an eye-tracker device 11, said means of processing of the data produced by said means of survey of the user gaze coordinates include means of data elaboration, for instance a personal computer 12, associated to said monitor 10 and to said eye-tracker device 11.

The apparatus according to the present invention develops the method following described, as shown in Fig. 2, where it is illustrated the flow chart that describes the single steps of it.

- a) A page that requires to the user to insert his own password is visualized (20) on said means of visualization associated to said means of data processing,
- 30 b) The user gaze coordinates are calculated (21) by the eye - tracking device.
- c) The data concerning said user gaze coordinates are sent (22) to said means of processing.

- d) The data concerning said user gaze coordinates are filtered (23) from said means of processing.
- e) The filtered data coming from the previous step are interpreted (24) to determine the corresponding optical command.
- 5 f) The action corresponding to said optical command is performed (25).
- g) An apposite feedback is sent (26) to said means of visualization.
- h) The steps a) - g) are repeated until the password is completely inserted.
- i) Said password is sent (27) to said means of interfacing with the security systems.
- 10 j) The code corresponding to said password is sent (28) to said security systems that determine its validity.

The step d) of the sequence previously described is developed by the raw data filtering module according to the steps sequence following described and illustrated in Fig. 3:

- 15 k) A pre-filtering is performed (30), so that the non valid samples are noticed and eliminated.
- l) The coordinates of the point gazed by the user are determined (31)
- m) The average and the standard deviation (32) related to the number desired of samples are calculated
- 20 n) The tolerances for the evaluations are planned (33)
- o) The acceptable data are discriminated (34) from those to be discarded

The determination of the optical command corresponding to the data coming from the eye-tracker, referring to the step e) of the sequence illustrated in the Fig. 2, is performed according to the following sequence and illustrated in Fig. 4:

- 25 p) The filtered data are elaborated (40) in order to determine what area of the interface has currently gazed from the user.
- q) The component of the graphical interface related to the area determined at the previous step is activated (41). The activation of such selection can for example happen using dwell time on the active component.
- 30 r) The optical command corresponding to the data coming from the previous step is determined (42), including the action to perform and a possible feedback to be sent to said means of visualization.

CLAIMS

1. Apparatus for the secure insertion of an access code characterized by comprising: means of visualization of graphic images or text, means of survey of the gaze coordinates of the user turned to said means of visualization, means of
5 processing of the data produced by said means of survey of the gaze coordinates of the user, means of interfacing with the security systems that regulate the access to the areas protected from password.
2. Apparatus for the secure insertion of an access code according to claim 1 characterized in that said means of processing of the produced data comprise
10 means of data filtering, means of determination of the areas activated by the user gaze - on said means of visualization - means of activation of the components belonging to said active areas, means of dispatch to said means of visualization, means of activation of feedback corresponding to the determined action, means of generating a password corresponding to the determined action and means of
15 dispatch of said password to said means of interfacing with the security systems.
3. Apparatus for the secure insertion of an access code according to claim 2 characterized in that said means of visualization of images comprise at least a monitor (10), said means of survey of the gaze coordinates of the user include at least an eye-tracker device (11).
- 20 4. Apparatus for the secure insertion of an access code according to claim 2 characterized in that said means of processing of the data produced by said means of survey of the gaze coordinates comprise an electronic calculator (12) suitably associated to said monitor (10) and to said eye-tracker device (11).
5. Apparatus for the secure insertion of an access code according to the previous
25 claim characterized in that said eye-tracker device (11) is integrated in said monitor (10).
6. Apparatus for the secure insertion of an access code according to the previous claim characterized in that said electronic calculator (12) is a personal computer.
7. Method for the secure insertion of an access code characterized in that it
30 comprises the following steps:
- a) A page that requires to the user to insert his own password is visualized (20) on said means of visualization associated to said means of data processing.

- b) The user gaze coordinates are calculated (21) by the eye - tracking device.
- c) The data concerning to said user gaze coordinates are sent (22) to said means of processing.
- d) The data concerning to said user gaze coordinates are filtered (23) from said
5 means of processing.
- e) The filtered data coming from the previous step are interpreted (24) to determine the corresponding optical command.
- f) The action corresponding to said optical command is performed (25).
- g) An apposite feedback is sent (26) to said means of visualization.
- 10 h) The steps a) - g) are repeated until the password is completely inserted.
- i) Said password is sent (27) to said means of interfacing with the security systems.
- j) The code corresponding to said password is sent (28) to said security systems that determine its validity.
- 15 8. Method for the secure insertion of an code access according to claim 7 characterized in that said step d) is performed by said raw data filtering module according to the following steps sequence:
 - k) A pre-filtering is performed (30) so that the non valid samples are noticed and eliminated.
 - 20 l) The coordinates of the point gazed by the user are determined (31)
 - m) The average and the standard deviation related to the number desired of samples are calculated (32)
 - n) The tolerances for the evaluations are planned (33)
 - o) The acceptable data are discriminated (34) from those to be discarded
- 25 9. Method for the secure insertion of an access code according to claim 8 characterized in that said step e) is performed according to the following steps sequence:
 - p) The filtered data are elaborated (40) in order to determine what area of the interface has currently gazed by the user.
 - 30 q) The component of the graphical interface related to the area determined at the previous step is activated (41). The activation of such selection can for example happen using dwell time on the active component.

- r) The optical command corresponding to the data coming from the previous step is determined (42), including the action to perform and a possible feedback to be sent to said means of visualization.

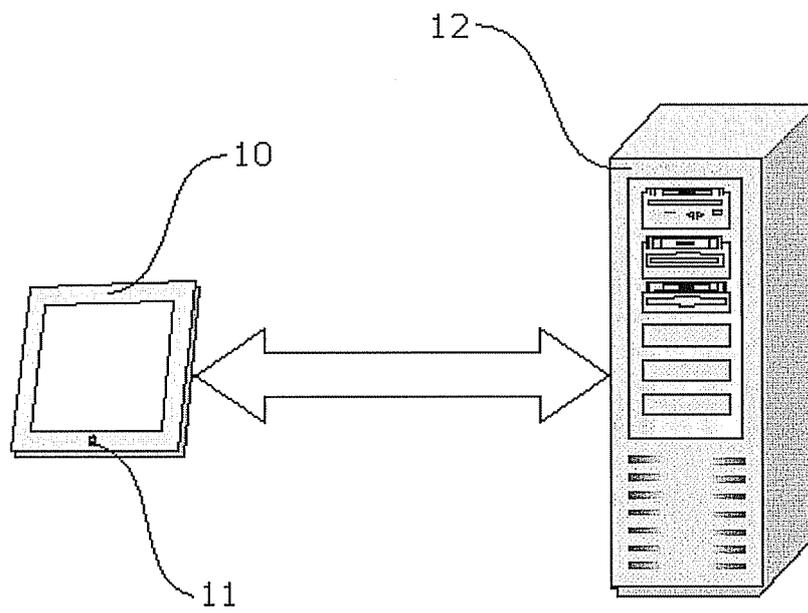


Fig. 1

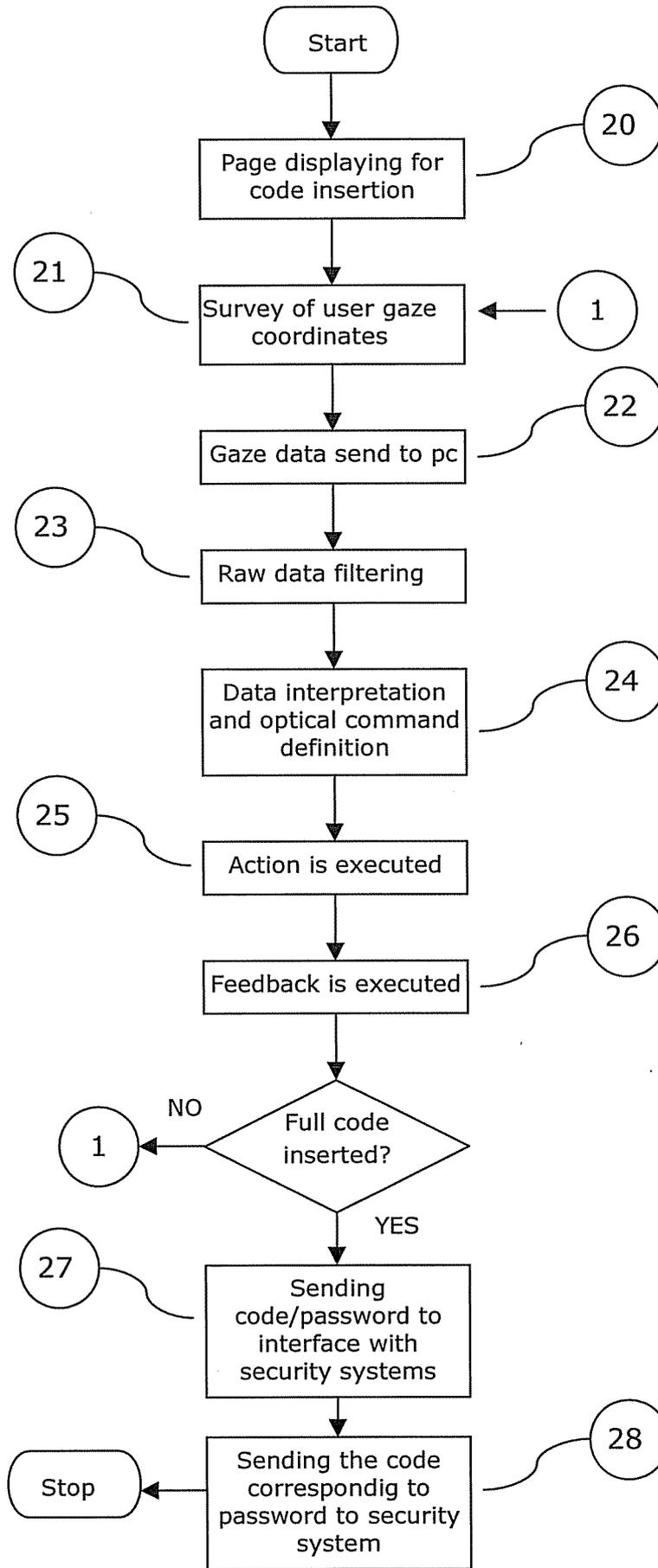


Fig.2

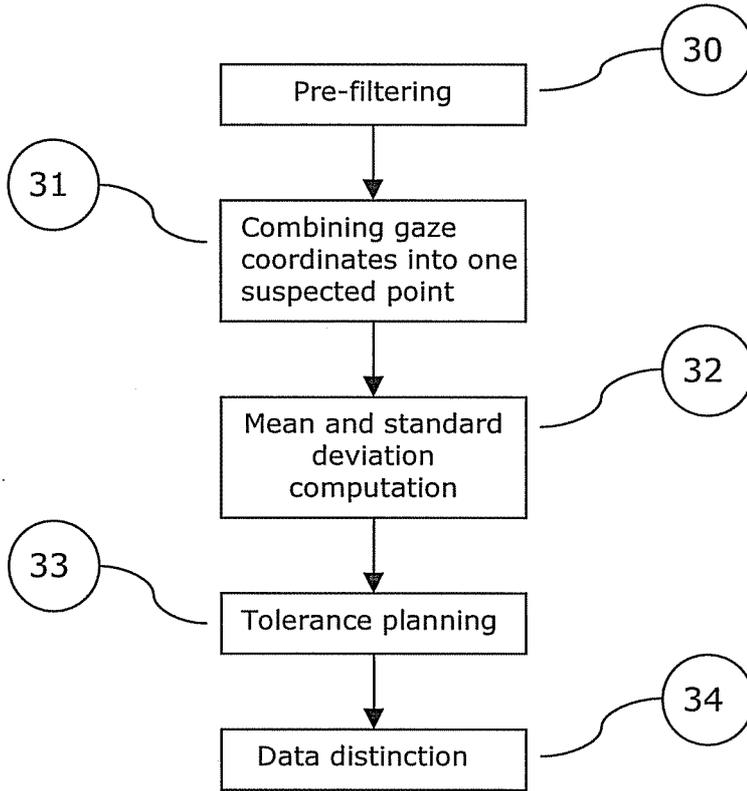


Fig.3

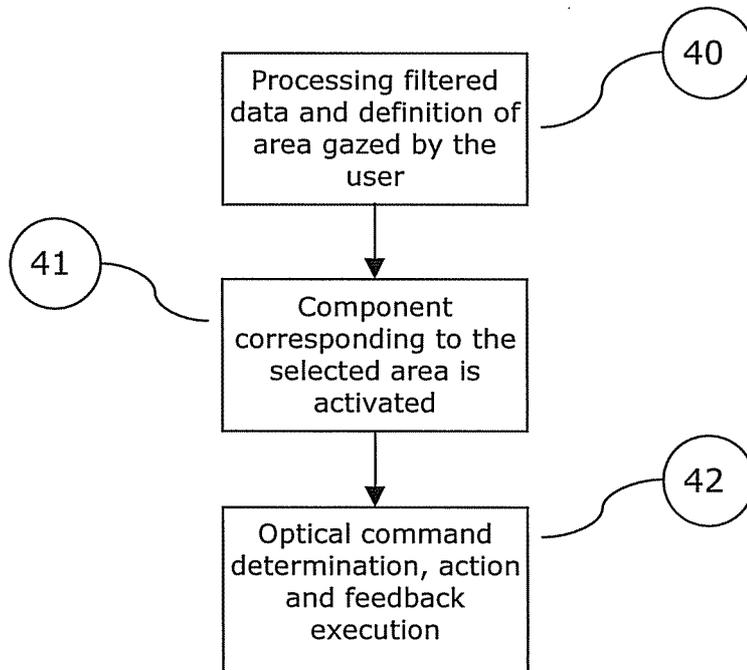


Fig.4

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G07F7/10 G06F3/00

According to International Patent Classification (IPC) onto both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 G07F G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2005/010836 A (ITAUTEC PHILCO S A GRUPO ITAUT [BR]; SENA JOAO ERNESTO FIGUEIREDO [BR]) 3 February 2005 (2005-02-03) page 2, line 23 - page 4, line 25 -----	1-9
X	US 6 282 553 B1 (FLICKNER MYRON DALE [US] ET AL) 28 August 2001 (2001-08-28) column 1, line 35 - column 2, line 23 column 3, line 54 - line 62 claims 1-3 -----	1-9
A	US 4 595 990 A (GARWIN RICHARD L [US] ET AL) 17 June 1986 (1986-06-17) column 2, line 60 - column 3, line 5 -----	1-9
A	US 5 471 542 A (RAGLAND RICHARD R [US]) 28 November 1995 (1995-11-28) abstract -----	1-9
	-/-	

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
21 November 2006	28/11/2006

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL- 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Wolles, Bart
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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2006/065133

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 973 149 A (HUTCHINSON THOMAS E [US]) 27 November 1990 (1990-11-27) abstract -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2006/065133

Patsnt document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2005010836	A	BR 0302525 A	05-04-2005
US 6282553	B1	NONE	
us 4595990	A	NONE	
us 5471542	A	NONE	
us 4973149	A	NONE	