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(54) **Method and device for electromechanical selection of the element from the plurality of elements**

(57) The present invention relates to a device for electromechanical selection of an element from a plurality of elements, having a housing of a regular shape, enabling the device to take N rest positions, where N is a natural number, and where each of the rest positions corresponds to one element selected from N elements, wherein the device is adapted to electrically transmit its rest positions data. Inside the housing a central module

4 is located, comprising a microcontroller coordinating the work of the other modules, a position analysis and identification module connected to the central module and equipped with at least one accelerometer, a wireless communication module 7 for wireless communication with external devices, and for transmitting the rest positions data, connected to the central module 4, and a power supply module 5, connected to the analysis, central and wireless communication modules.

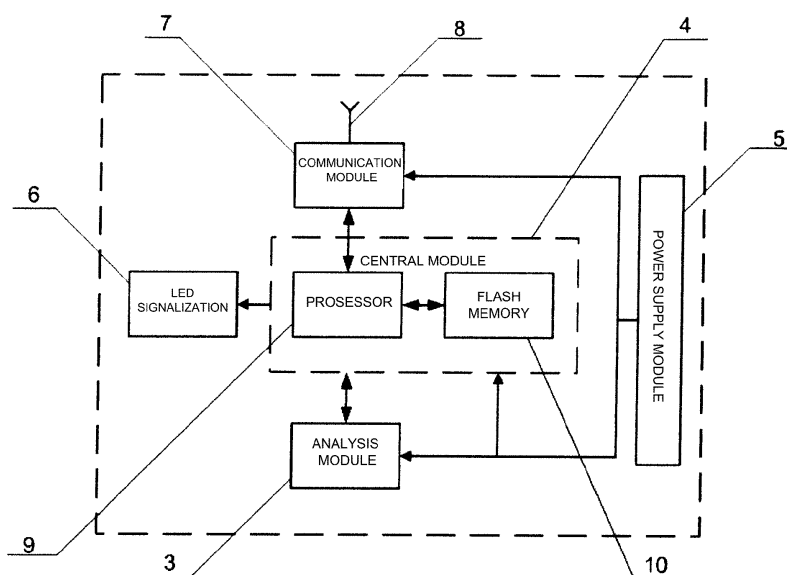


Fig. 2

Description

[0001] The present invention relates to a method and a device for electromechanical selection of an element from a plurality of elements, said device having a housing of a regular shape enabling the device to take N rest positions, where

[0002] The methods and devices of this type are applied, for example, in games - for generating random elements from a plurality of elements. Drawing an element is performed by forcing a random move of the device, followed by readout of the result from the device being in a rest position. The simplest example of a purely mechanical random result generating device is a cubic die; however, devices of different shapes, having from two to one hundred rest positions, are known in the state of the art.

[0003] A wireless cubic die comprising a position detector and a transmitter for transmitting die position data to the receiver is known from US patent description No. US 2009/0104976 (Philips Intellectual Property & Standards). The position detector comprises piezoelectric sensors with cantilevers or a movable magnet combined with a sensing coil. A disadvantage of this solution is the limited possibility of reading the parameters of the die's movement, especially in the case of lack of contact with a surface, as well as the limited angle resolution.

[0004] Electronic dice for computer games, having n faces, where n is greater than 2, and n-1 position sensors, is known from the patent No. US 6,331,145 (Cibro Technologies Ltd). The sensors comprise RFID transponders or optical sensors, wherein the face lying on the surface is identified. A drawback of this solution is, again, the limited possibility of reading the dice's movement parameters, especially when it does not contact the surface. Another drawback are technology-related complications in the housing of multi-face dice. This type of solution cannot be applied to dice having two stable positions.

[0005] Accelerometers applied in cell phones (e.g. Nokia) for games requiring identification of a telephone's orientation are also known. These accelerometers were originally used to determine the orientation (horizontal - vertical) of a cell phone photo camera. In this case the angle resolution is sufficient for most applications, however, a telephone is not suitable for random position selection, and hence it is not suitable for a random selection of an element from a plurality of elements.

[0006] The device for electromechanical selection of an element from a plurality of elements according to the present invention, having a housing of a regular shape, enabling the device to take N rest positions, where N is a natural number, and where each of the rest positions corresponds to one element selected from among N elements, wherein the device is able to electrically transmit its rest positions data, stands out in that a central module is located inside the housing, comprising a microcontroller coordinating the work of the other modules, a position analysis and identification module connected to the central module and equipped with at least one accelerometer, a wireless communication module for wireless communication with external devices and for transmitting the rest positions data, connected to the central module, and a power supply module, connected to the analysis, central and wireless communication modules.

[0007] According to a preferred embodiment, at least one accelerometer in the position analysis and identification module is a three-axis accelerometer.

[0008] Preferably, the wireless communication module comprises a Bluetooth communication device.

[0009] In another preferred embodiment, the wireless communication module comprises a WiFi communication device.

[0010] In a preferred embodiment, the wireless communication module comprises a GPRS communication device.

[0011] According to another preferred embodiment, the wireless communication module comprises a RFID communication device. According to another preferred embodiment, the communication module comprises a Wireless USB communication device. Preferably, the housing of the device comprises a device for displaying the selection result.

[0012] Preferably, the selection result displaying device comprises LED diodes, and the central module is preferably connected to an additional LED diodes control module.

[0013] The method of electromechanical selection of an element from a plurality of elements - according to the present invention - by means of a device having a housing of a regular shape, enabling the device to take N rest positions, where N is a natural number, and where each rest position corresponds to one element selected from among N elements, where the rest positions data of the device is transmitted electrically, stands out in that the position of at least one accelerometer is assigned to a position of a device having a housing of a regular shape, based on which assignment the accelerations of the housing are determined and analyzed while the device is in motion or in a rest position. Subsequently, the device acceleration and/or position data is transmitted to at least one of the external devices. A selection of an element from a plurality of elements is made on the base of an analysis of the acceleration and/or position data regarding the device having a housing of a regular shape.

[0014] Preferably, the device is used for random selection of elements in computer, TV and communication devices, for computer and board games, and for the purpose of generating random results in training devices.

[0015] The embodiment of the subject invention is described in detail, by the way of example, in the attached drawing, where fig. 1 presents a schematic view of the device; fig. 2 shows the internal architecture of the device; fig. 3 illustrates the method for identification of the position with respect to the horizontal surface of the device having face S3 lying on

the surface; fig. 4 shows the method for identification of the position with respect to the horizontal surface of the device having face S1 lying on the surface; fig. 5 shows the method for identification of the position with respect to the horizontal surface of the device having face S4 lying on the surface; fig. 6 shows the method for identification of the position with respect to the horizontal surface of the device having face S6 lying on the surface; fig. 7 shows the method for identification of the position with respect to the horizontal surface of the device having face S5 lying on the surface; fig. 8 shows the method for identification of the position with respect to the horizontal surface of the device having face S2 lying on the surface; fig. 9 shows a state diagram for the device, while fig. 10 shows flow chart of an algorithm for detecting a throw and identifying the result.

[0016] Figure 1 shows a schematic view of the housing 1 of a body having a regular shape with N=6 faces, encompassing an electronic circuit allowing to identify the housing's position with respect to a horizontal surface 2. The faces of the housing are marked as S1-S6.

[0017] Fig. 1 shows faces S1, S4 and S5, while faces S2, S3 and S6 are not visible. In the position shown in fig. 1, the housing 1 is positioned with face S3 facing the horizontal surface 2.

[0018] The housing encompasses an electronic circuit having architecture as presented in fig. 2. The main element of the device is a central module 4, comprising, in particular, a processor 9 and a Flash memory 10 for storing the data of all operations performed by the processor 9. A position analysis and identification module 3 allows to identify accelerations acting on the device in three axes (x,y,z, see fig. 3 for comparison). A central module 4 is connected to Light Emitting Diodes (LED) 6, used for signaling the correctness of a throw and/or the result. A result of a throw is transmitted wirelessly by a communication module 7, (using the Bluetooth technology). Any communication technology may be used, such as e.g. RFID/NFC, infrared, WiFi, GPRS, Wireless USB, for the purpose of transmission to the environment, i.e. an external device equipped, in this embodiment, with a Bluetooth and a HID (Human Interface Device). To ensure optimal range, the communication module 7 comprises an antenna 8. All electronic elements are powered by means of a power supply module 5.

[0019] The position analysis and identification module 3 comprises a three-axis accelerometer allowing to identify each of the rest positions by means of the values of the acceleration vector on three axes (x, y, z). The method of identification is shown in fig. 3-8, showing in detail six positions of the housing 1 on each of the faces marked S1-S6. The table below contains the values of acceleration vectors identified by the orientation analysis and identification module 3.

Table

Readouts of the acceleration depending on the orientation of the housing.				
Face	Readout acceleration x	Readout acceleration y	Readout acceleration z	Fig. No.
S1	+1 g	0	0	4
S2	0	0	-1 g	8
S3	0	-1 g	0	3
S4	0	+1 g	0	5
S5	0	0	+1 g	7
S6	-1 g	0	0	6

[0020] Fig. 9 shows a state diagram of the device. After starting (START) the device passes to the idle state. Following detection of the movement, the device passes to the active state. If the duration of a throw T exceeds the programmed threshold value T_R , the device restarts automatically. If the duration of a throw does not exceed the threshold value T_R and stoppage is detected, the throw is verified and the data is transmitted. If a throw is correct, the device passes to the throw correctness signaling state. Otherwise, it passes to the error signalization state. From this state the device automatically passes back to the idle state.

[0021] Following the device being turned on by a sampling person, the power supply module begins to supply power to the other modules, while the central module and the LED control module communicate, by means of the diodes, their readiness for operation.

[0022] A sampling person throws the housing in order to begin the generation of the result. Then the central module and the position analysis and identification module collect and process the data on the force and length of the throw in order to determine whether the throw was correct (whether the device remained in motion for a suitable period of time, and whether it turned around its xyz axes to a sufficient extent).

[0023] Following attaining the rest position, the central module and the position analysis and identification module

verify the angle of the surface on which the device is positioned, in order to determine the possibility of a correct reading of the result of drawing. If a throw is sufficiently long/powerful, and if the device is positioned on a flat surface allowing readout of the result, the result is determined.

[0024] In case of an incorrect reading of the result, the central module and the LED diodes control module communicate the error by means of a diode, and then pass back to their initial state.

[0025] In case of a correct reading of the result, the central module and LED diodes control module identify the drawn element, while the wireless communication module transmits the result to the environment (i.e. to a device receiving the results), then the device passes back to the initial state.

[0026] If the device remains active for a specified period of time (e.g. 5 minutes) without a change in its position being detected, the central module switches off the power supply module, thereby switching off the device.

[0027] The device's operation from the moment of detection of its stoppage to signaling the correctness of a throw is shown in fig. 10.

[0028] The solution according to the present invention gives more freedom to the designer with regard to the type and weight of the die's housing, as the accelerometer operates independently of the weight of the device, and the pressure force is of a little importance. In the case of e.g. games, the shape of the housing may be similar to a natural cube (in terms of weight), in which case it cannot be blamed for generating wrong results. An additional advantage for such applications is the fact that the accelerometer has the possibility to check whether the cube turns by at least 90 degrees, which is the natural result of a throw. Moreover, the use of an accelerometer gives the possibility to determine the moment in which the die leaves the palm of the hand on the basis of a free fall detection, thus preventing cheating. The prior art solutions do not have the above-mentioned advantages.

[0029] As the position analysis and identification module remains operational throughout the duration of the device's movement, there is the possibility to transmit the movement path data to a computer, which can subsequently analyze the throw and perform, based on the result data, a visualization, which increases the attractiveness of games, and is important from the point of view of education-related applications.

[0030] The solution according to the invention allows to obtain a better probability distribution for a random selection of an element from a plurality of elements than in the case of computer generators of random numbers. In the case of entertainment-related applications, the device according to the invention allows to increase the attractiveness of games by combining classic and computer technologies.

[0031] It is obvious that the only purpose of the above embodiment is to illustrate the solution according to the present invention and that it does not limit the scope of protection in any way.

[0032] A person skilled in the art will readily notice that, for example, the shape of the housing, the communication technology, the positioning of the modules etc. may be changed without compromising the scope of the protection.

Claims

1. A device for electromechanical selection of an element from a plurality of elements, having a housing of a regular shape, enabling the device to take N rest positions, where N is a natural number, and where each of the rest positions corresponds to one element selected from among N elements, where the device is able to electrically transmit its rest positions data, **characterized in that** inside the housing (1) a central module (4) is located, comprising a microcontroller coordinating the work of the other modules, an position analysis and identification module (3) connected to a central module (4) and equipped with at least one accelerometer, a wireless communication module (7) for wireless communication with external devices and for transmitting the rest positions data, connected to the central module, and a power supply module (5), connected to the analysis module (3), the central module (4) and the wireless communication module (7).
2. A device according to claim 1, **characterized in that** at least one accelerometer in the position analysis and identification module (3) is a three-axis accelerometer.
3. A device according to claim 1, **characterized in that** the wireless communication module (7) comprises a Bluetooth communication device.
4. A device according to claim 1, **characterized in that** the wireless communication module (7) comprises a WiFi communication device.
5. A device according to claim 1, **characterized in that** the wireless communication module (7) comprises a GPRS communication device.

6. A device according to claim 1, **characterized in that** the wireless communication module (7) comprises a RFID communication device.
7. A device according to claim 1, **characterized in that** the wireless communication module (7) comprises a Wireless USB communication device.
8. A device according to claim 1, **characterized in that** the housing (1) comprises a device for displaying selection result.
9. A device according to claim 8, **characterized in that** the device for displaying selection result comprises LED diodes (6), and the central module (4) is connected to an additional LED diodes control module (6).
10. Method for electromechanical selection of an element from a plurality of elements by means of a device having a housing of a regular shape enabling the device to take N rest positions, where N is a natural number, and where each of the rest positions corresponds to one element selected from N elements, wherein the device's rest positions data is transmitted electrically, **characterized in that** the position of at least one accelerometer is assigned to a position of the device having a housing of a regular shape, based on which assignment the accelerations of the housing are determined and analyzed while the device is in motion or in a rest position; subsequently, the device acceleration and/or orientation data is transmitted to at least one of the external devices, wherein the selection of an element from a plurality of elements is made on the base of an analysis of the acceleration and/or position data regarding the device of a regularly shaped housing.
11. Application of the device specified in claims 1-9 to a random selection of elements in computer, TV and communication devices, for computer and board games, and for the purpose of generating random results in training devices.

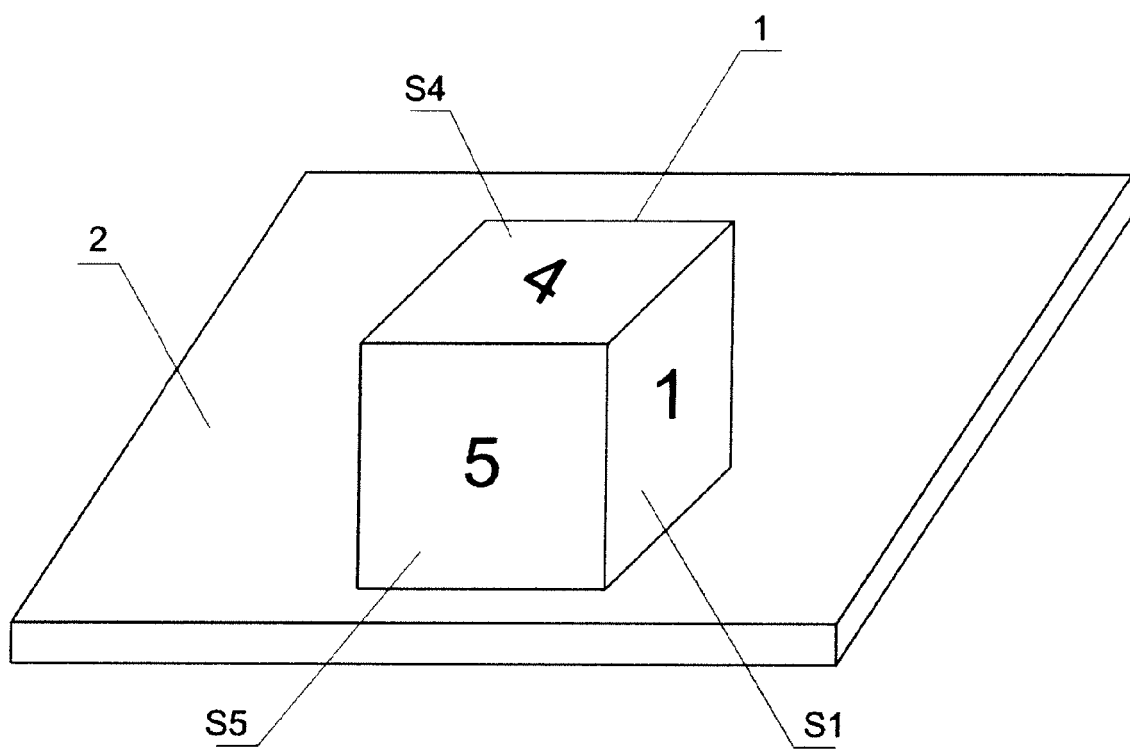


Fig. 1

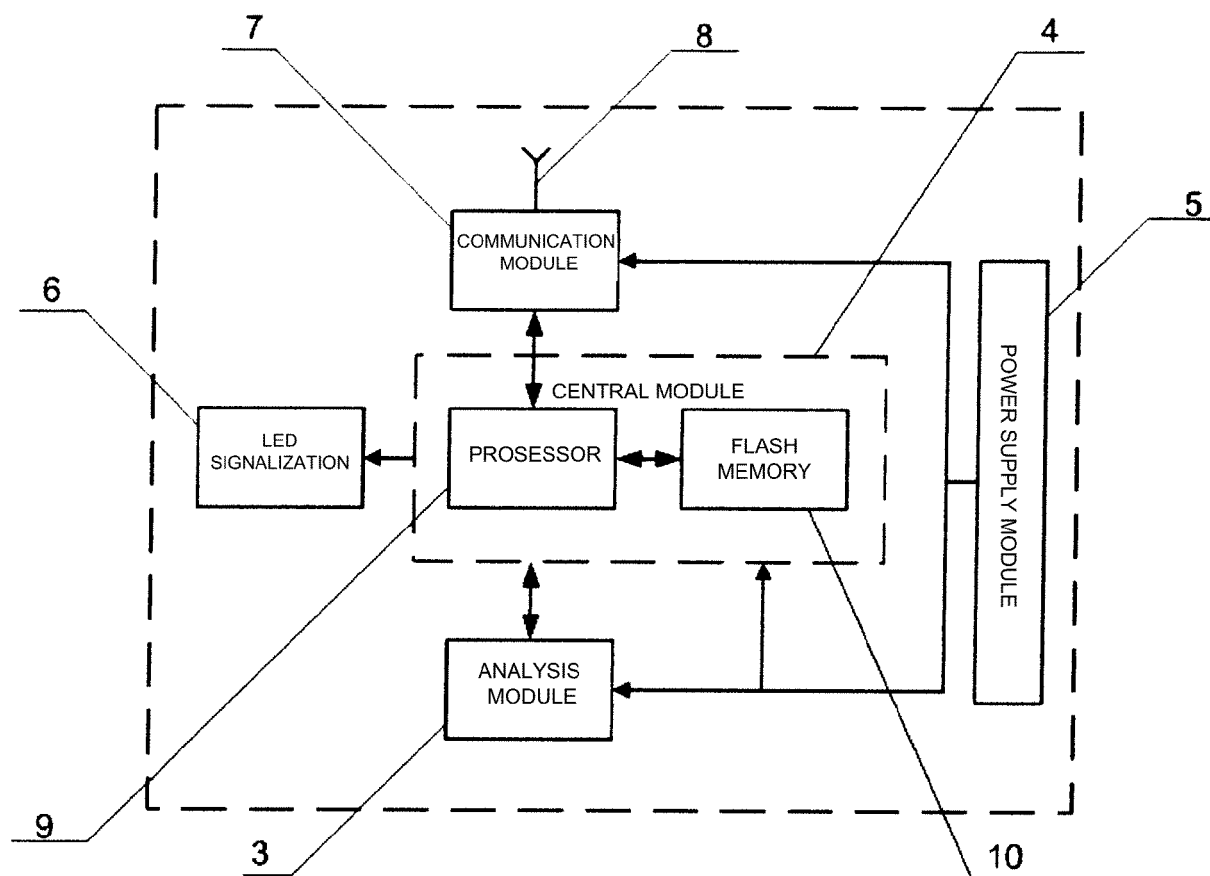


Fig. 2

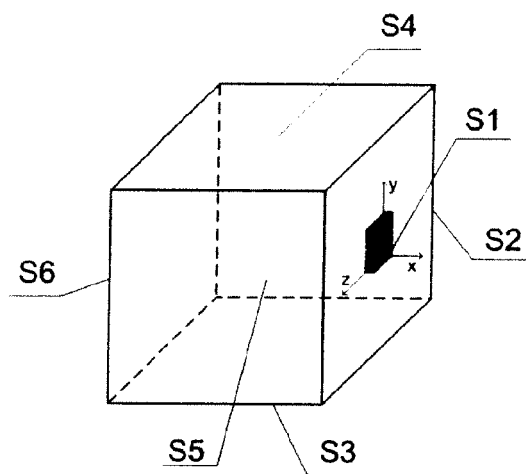


Fig. 3

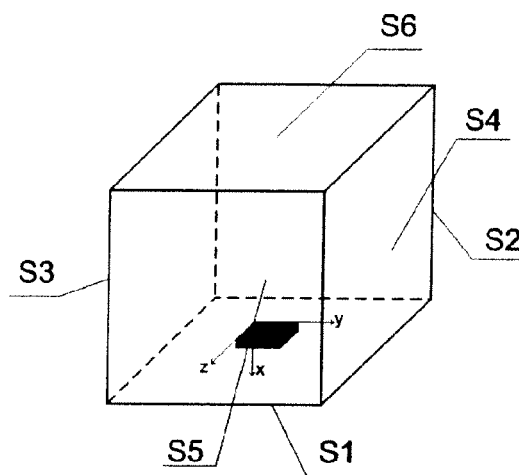


Fig. 4

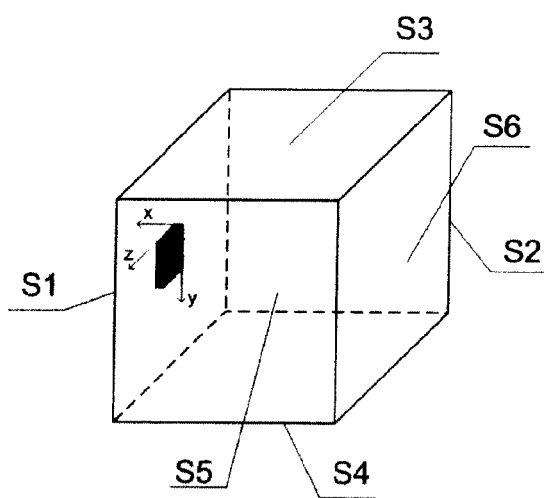


Fig. 5

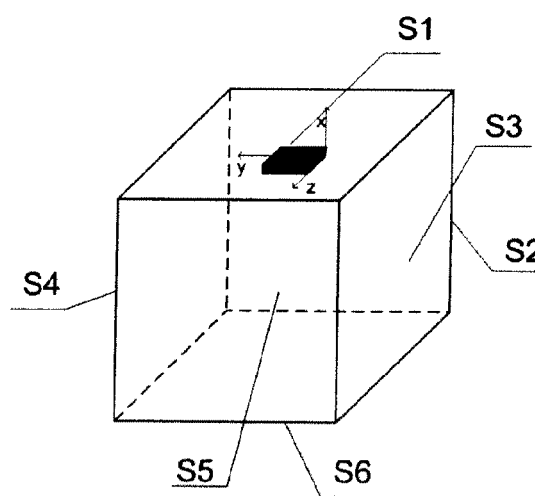


Fig. 6

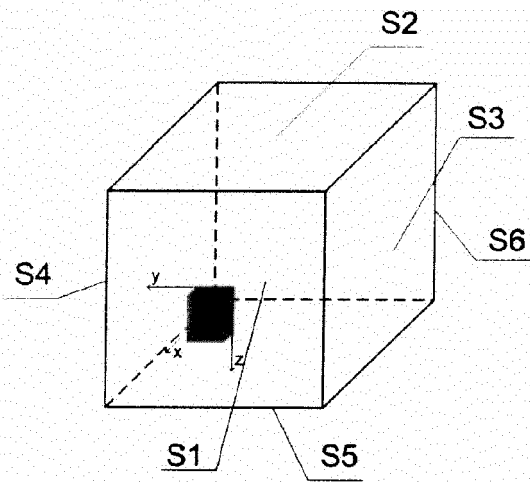


Fig. 7

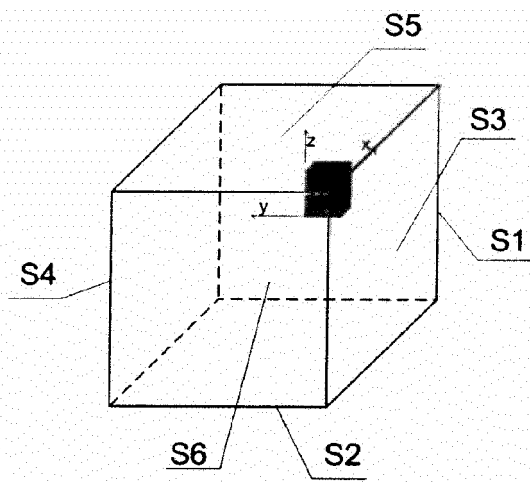


Fig. 8

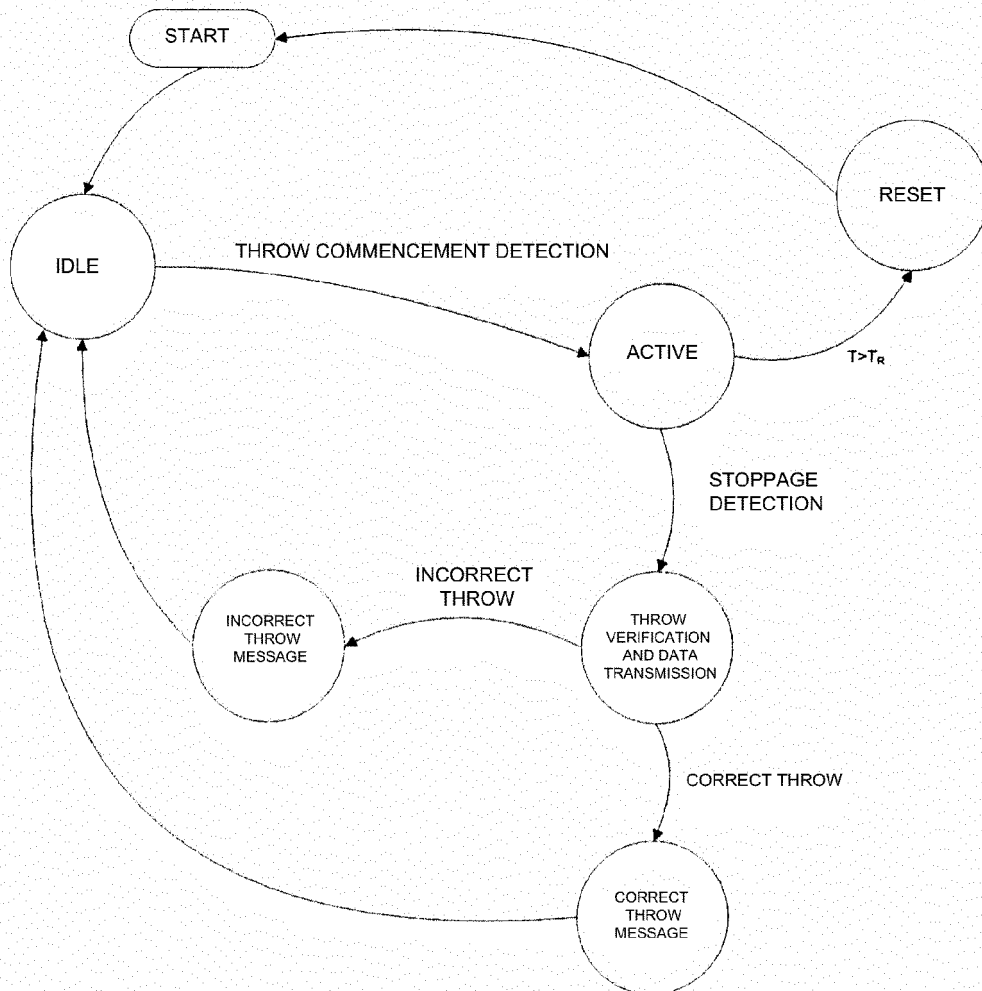


Fig. 9

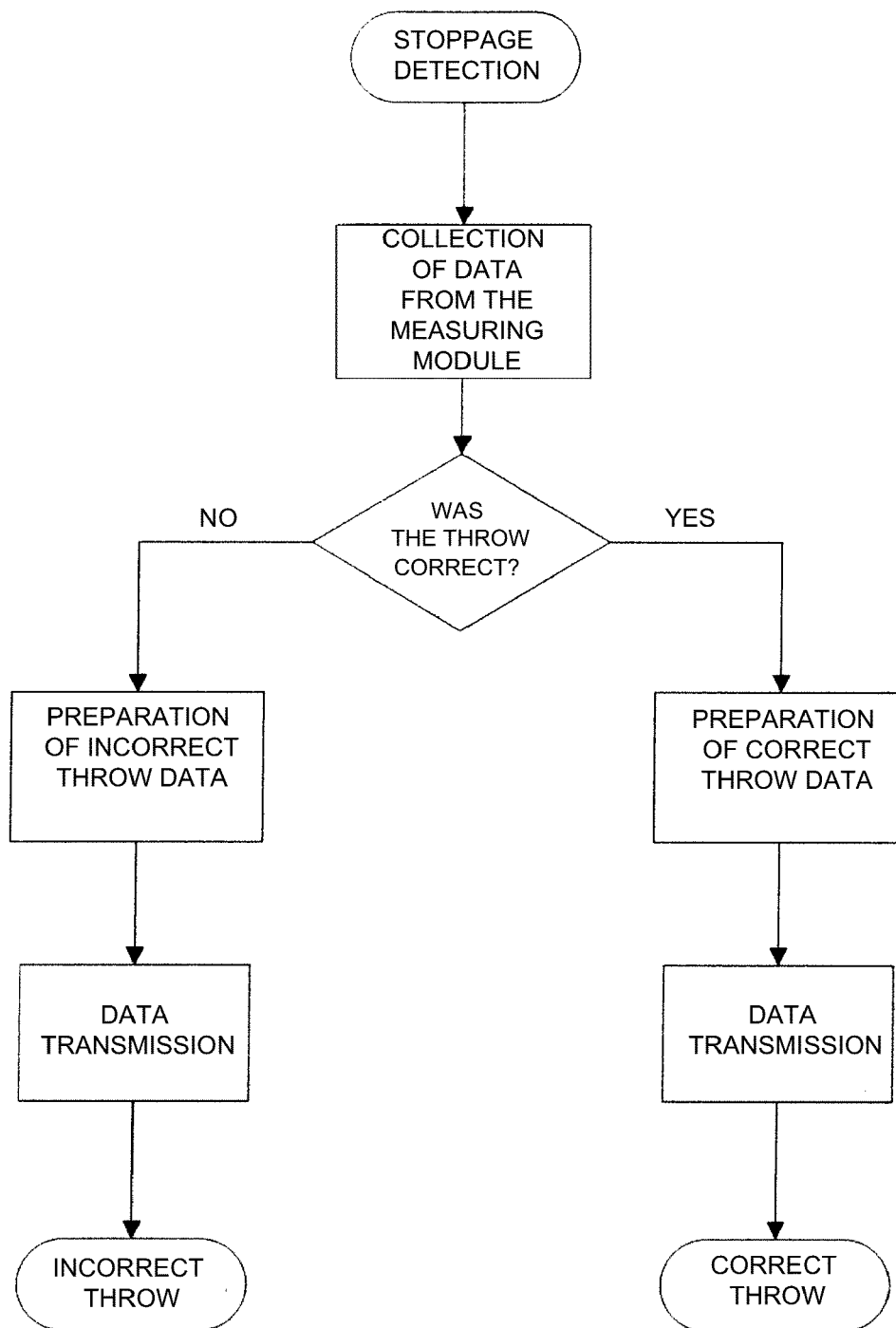


Fig.10



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7552

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 00/52672 A1 (CIBRO TECHNOLOGIES LTD [IL]; BRONFELD JOSHUA [IL]; SITY REFAEL [IL]; K) 8 September 2000 (2000-09-08) * page 16, line 30 - page 18, line 19; claims 1-20; figures 1-8 * * page 12, line 24 - line 25 *	1-8,10,11	INV. A63F9/04
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X	US 2008/122612 A1 (LARUE DANIEL V [US]) 29 May 2008 (2008-05-29) * paragraph [0049]; figures 1-10 * * paragraph [0080] - paragraph [0081] *	1-11	
A	WO 2006/046169 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; OUWERKERK MARTIN [NL]; AARTS RONA) 4 May 2006 (2006-05-04) * figures 1-6 * * paragraph [0041] * * paragraph [0048] - paragraph [0049] *	1-11	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) A63F
Place of search Munich		Date of completion of the search 21 August 2012	Examiner Shmonin, Vladimir
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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