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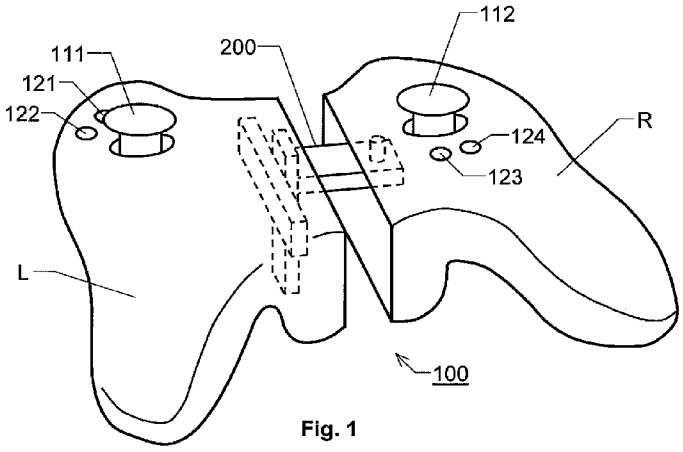

Fig. 1

(57) Abstract: A game control device (100) includes a first module (L) adapted to be held by a first hand of a user and a second module (R) adapted to be held by a second hand of the user. A link arrangement (200) mechanically interconnects the first and second modules (L; R). The link arrangement (200) is configured to allow the first and second modules (L; R) to move relative to one another while being interconnected. The link arrangement (200), in turn, includes a set of guide members configured to allow the first and second modules (L; R) to move linearly relative to one another in at least one dimension and in response thereto produce input commands to a computer in a convenient manner. In addition thereto, the device (100) preferably also receives output signals from the computer apparatus, and in response thereto causes the first module (L) to move relative to the second module (R), thus providing a haptic interface between the user and the computer.

WO 2011/056104 A1

Game Control Device

THE BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates generally to control means configured to generate input signals to computers in an intuitive and user-friendly manner. More particularly the invention relates to a game control device according to the preamble of claim 1.

Today, computer games and video game consoles is a global industry, and the consumers/players demand increasingly realistic interactions with the environments simulated by the computer. Thus, a wide variety of sophisticated game control devices have been developed, for example providing force feedback or tactile feedback representing various forms of haptics. A haptic device is an input/output interface that involves physical contact between the computer and the user, such as a joystick or data gloves, which both senses the movements of the user's body and delivers return signals to the user's body. Hence, by using haptic devices, the user cannot only feed information to the computer; he/she may also receive information from the computer in the form of a felt sensation on one or more parts of the body. This is referred to as a haptic interface. For example, in a virtual reality environment, a user can pick up a virtual tennis ball using a data glove. The computer senses the movement and moves the virtual ball on the display. However, due of the nature of a haptic interface, the user will feel the tennis ball in his/her hand through tactile sensations that the computer sends through the data glove, mimicking the feel of the tennis ball in the user's hand. Consequently, the haptic interface is capable of producing highly realistic experiences of computer simulated events and environments. Some haptic devices may even simulate torque and inertial effects associated with moving elongated and/or heavy objects in a computer simulated environment.

US 2006/0290662 describes a system for providing haptic feedback to a user. A wide variety of actuator types may here be em-

ployed to provide synchronized vibration, including linear actuators, rotary actuators, rotating eccentric mass actuators and rocking mass actuators. A controller sends signals to one or more driver circuits for directing operation of the actuators. The controller may provide direction and amplitude control, vibration control and frequency control to direct the haptic experience. Parameters such as frequency, phase, amplitude, duration and direction can be programmed or input as different patterns suitable for use in gaming, virtual reality and real-world situations. In all described embodiments, the game controller is a rigid unit adapted to be held by a user's both hands.

US 2007/0293318 discloses a video game controller that includes separate left-hand and right-hand controller shells. The left-hand controller has a conventional joystick movement controller, while the right-hand controller has a trackball movement controller. One or both of the left-hand and right-hand controllers include a sensitivity module, which augments or diminishes the movement signal sent by the controller in response to player input. Tactile feedback may also be provided to the user via the controller shells. In any case, the controllers have no mechanical connection with one another.

WO 2006/084744 describes a device for transmitting movements, where a parallel kinematics transmission structure provides at least one degree of freedom with respect to a symmetry axis. The parallel kinematics transmission structure includes a base member, a moveable member, and at least one parallel kinematics chain coupling the base member and the moveable member. Each parallel kinematics chain has a first arm moveable in a movement plane wherein the movement planes are at a distance to a symmetry axis. This enables a user to sense relatively advanced haptics. However, the bulky base member and delicate design of the kinematics chains renders the solution unattractive for consumer products, such as game controllers.

JP 2000-218041 reveals a controller device for game equipment,

which device includes a right-hand controller and a left-hand controller that are interconnected via hinges. In an initial state, when a player operates the controller device the right- and left-hand controllers are positioned together. If for example during a game the player receives an attack from a fighting opponent, a rotary cam inside the controller device is rotated by a driving motor of large start torque. As a result, the right- and left-hand controllers are instantaneously separated, so that the player bodily feels the game sensation of an impact. Although different embodiments are described, the document exclusively presents various types of angular movements where the right-hand controller is rotated relative to the left-hand controller in a single dimension.

The above-mentioned documents all relate to solutions for improving a user's experience of a computer game, or a similar application. Except for WO 2006/084744, none of these solutions offers very realistic user experiences of more complex haptic events, for example representing inertia and moments of force, or torque.

As described in WO 2006/084744, interfaces exist that are capable of producing highly realistic and complex haptics or force feedback to a user, who may be engaged in computer gaming. Similar, however more sophisticated interfaces also exist for use in critical areas, where the requirements on authenticity and accuracy are exceptionally high, e.g. in medical applications, when practicing before a surgical operation or another complex procedure, or in connection with remote operations where a physician controls one or more surgical robots via a communications network. These devices are extremely expensive, and therefore cannot be employed in consumer products. Nevertheless, in analogy with the approach of WO 2006/084744, the user here normally manipulates a handle or pen like input member, which is connected to a high-precision robotic arm having three or six degrees of freedom (e.g. allowing spatial movements in three dimensions and/or rotation along three axes being mutually ortho-

gonal). Any forces generated by the haptic interface are brought to the user based on a fix point represented by a base of the robotic arm. As mentioned above, applying such an approach to enhance the haptics in consumer applications (e.g. control devices for computer games) is less attractive. Namely, here it is important that the control device is compact, lightweight, and at the same time robust and inexpensive.

SUMMARY OF THE INVENTION

The object of the present invention is therefore to alleviate the above problems and thus offer a neat, uncomplicated and cost-efficient game control device that is capable of providing a rich, flexible and intuitive user interaction with a computer apparatus.

According to the invention, the object is achieved by the game control device as initially described, wherein the link arrangement includes a set of guide members configured to allow the first and second modules to move linearly relative to one another in at least one dimension, and in response thereto produce a subset of the input commands to the computer apparatus.

This control device is advantageous because the device enables the user to generate and enter input commands in a very straightforward manner.

According to one preferred embodiment of the invention, the link arrangement is configured to allow the first module to move linearly relative to the second module along directions having a first orientation, and in response to such movements produce at least one first command of the input commands. The link arrangement is also configured to allow the first module to move linearly relative to the second module along directions having a second orientation being essentially perpendicular to the first orientation. In response to the latter movements, the link arrangement is configured to produce at least one second command of the input commands. Hence, input commands may be produ-

ced based on relative movements of the first and second modules in a plane (i.e. in two dimensions). This gives the user a high degree of flexibility to interact with the computer apparatus.

According to another preferred embodiment of the invention, the link arrangement is likewise configured to allow the first module to move linearly relative to the second module along directions having a third orientation, which is essentially perpendicular to both the first and second orientations. In response to such movements, the link arrangement is configured to produce at least one third command of the input commands. As a result, the user can generate input commands based on relative movements the first and second modules in a given volume (i.e. in three dimensions). This further enhances flexibility of the user-computer interaction.

According to yet another preferred embodiment of the invention, the link arrangement is configured to allow the first module to be rotated relative to the second module around a rotation axis. In response to such rotations, the link arrangement is configured to produce a subset of the input commands. Naturally, the link arrangement may be provided with two or more rotation axes of this type, and the embodiment may be combined with any of the above-mentioned embodiments. Thus, an exceptionally high degree of flexibility to interact with the computer apparatus is attainable.

According to a further preferred embodiment of the invention, the device is configured to receive output signals from the computer apparatus, and in response to the output signals cause the first module to move relative to the second module. This means that the user can experience force-feedback effects and/or haptics, which is desirable in applications where high-level realism is important. For example, the game control device may include at least one first actuator, which in response to at least one first signal of the output signals, is configured to cause the first module to move linearly relative to the second module along direc-

tions having a first orientation.

According to other preferred embodiments of the invention, the game control device includes a second and/or third actuator each of which, in response to at least one respective signal of the output signals, is configured to cause the first module to move linearly relative to the second module along directions having a second or third orientation respectively being essentially perpendicular to one another as well as to the first orientation. As a result, highly complex sets of forces and movement patterns (e.g. representing haptic events) may be conveyed to a user via holding the game control device. In short, this is rendered possible by the user grasping the device and intuitively wishing to retain it in his/her hands, thus constituting a function equivalent to the fix point of the robotic arm mentioned above.

According to an additional preferred embodiment of the invention, at least one of the actuators includes a linear electric motor, e.g. of so-called voice-coil or linear-step type. This is advantageous because such motors can be made compact and yet powerful. It is also relatively easy to integrate position sensors therein, so that a guide member and an actuator for a given dimension constitute a single component.

According to still another preferred embodiment of the invention, the game control device includes at least one angular actuator configured to receive the output signals, and in response to cause the first module to rotate relative to the second module around a rotation axis. Thereby, further enhanced haptics may be represented to the user, for instance describing various forms of inertia and torque.

According to yet another preferred embodiment of the invention, the game control device includes one or more communication interfaces configured to forward the input commands to the computer apparatus and receive the output signals from the computer apparatus. For example, one communication interface

may be adapted to exchange data related to the input commands and the output signals with the computer apparatus by wire, i.e. electrically and/or optically. Alternatively, or as a complement thereto, the device may include a wireless interface configured to forward the input commands to the computer apparatus. Hence, radio signals, light pulses or magnetic induction may be used for the data transfer. In any case, the proposed interfaces provide a high degree of freedom as to how the game control device and the computer apparatus are interconnected.

According to another preferred embodiment of the invention, the game control device includes at least one input member configured to be manipulated by the user and in response thereto generate a subset of the input commands. Consequently, the user is not limited to produce input commands exclusively by moving the first and second modules relative to one another.

Further advantages, beneficial features and applications of the present invention will be apparent from the following description and the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is now to be explained more closely by means of preferred embodiments, which are disclosed as examples, and with reference to the attached drawings.

Figure 1 illustrates schematically a game control device according to one embodiment of the invention;

Figures 2a-b show embodiments of a link arrangement according the invention;

Figure 3 illustrates a volume within which the modules of the proposed game control device may move relative to one another to produce input commands to a computer apparatus;

Figure 4 shows an example of an individual member of the link arrangement in Figures 2a and 2b according to

one embodiment of the invention; and

Figure 5 shows a computer system including the proposed game control device.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

We refer initially to Figure 1, which illustrates schematically a game control device 100 according to one embodiment of the invention. The game control device 100 is configured to generate input commands to a computer apparatus, e.g. included in a game console or in the form of a PC (personal computer). The device 100 includes a first module L and a second module R. The first module L is adapted to be held by a first hand of a user (say his/her left hand) and the second module R is adapted to be held by a second hand of the user (say his/her right hand). A link arrangement 200 mechanically interconnects the first and second modules L and R. The link arrangement 200 is configured to allow the first and second modules L and R to move relative to one another while being interconnected. To this aim the proposed link arrangement 200 includes a set of guide members configured to allow the first and second modules L and R to move linearly relative to one another in one or more dimensions, preferably three, and in response to such movements produce input commands to the computer apparatus.

Preferably, the device 100 also has one or more input members configured to be manipulated by the user and via which the user may generate input commands. For example, a first subset of input commands are generated by the relative, linear movements of the first and second modules L and R, and a second subset of input commands are generated by manipulating first and second input members 111 and 112 in the form of joysticks. However, alternatively, the first and second subsets may overlap, so that some, or all, of the input commands may be generated both via relative movements of the first and second modules L and R *and*

by manipulating the first and second input members 111 and 112. The device 100 may also be equipped with various buttons, keys and/or switches 121, 122, 123 and 124 for special commands/game functions, related firing, gear shifting etc. depending on the application being run on the computer apparatus.

Referring now to Figure 2a, we see a first embodiment of the link arrangement 200 according the invention. Figure 2b shows a second embodiment of the link arrangement 200. Each embodiment has its particular advantages. For instance, the embodiment in Figure 2a ensures that the first and second modules L and R can be moved freely without risking that any of the guide members 210Y, 220Z or 230X limits movements along any of the other guide members; and the embodiment in Figure 2b renders it possible to power all the guide members 210Y, 220Z and 230X exclusively from one of the first and second modules L and R.

In any case, both embodiments show three guide members 210Y, 220Z and 230X, which each enables the first module L to move linearly relative to the second module R along a given direction. The guide members 210Y, 220Z and 230X and are oriented essentially perpendicular to one another, and consequently represent the axes of a three-dimensional space. This will be described in further detail below with reference to Figure 3.

Nevertheless, according to the invention, the link arrangement 200 may be specifically configured to allow the first module L to move linearly relative to the second module R along directions x having a first orientation. In response to such movements, the link arrangement 200 is configured to produce at least one first command, say controlling leftward and rightward movements in a computer generated environment. To this aim, a first guide member 230X in the link arrangement 200 is adapted to be connected with a first surface LCM, either directly to the first module L, or indirectly via one or more other guide members 220Z and/or 210Y. A second surface RCM of the link arrangement 200 is connected to the second module R. Moreover, the first guide

member 230X may have an elongated opening (e.g. in the form of a notch or channel) extending along said first orientation as illustrated in Figures 2a and 2b. However, as is apparent from Figure 3, other guide member designs are likewise possible according to the invention. In the embodiment shown in Figure 2a, the second surface RCM is connected to sliding/rolling means running in the channel (behind the notch), such that the second surface RCM is allowed to move relative to the a first surface LCM along the directions x. In the embodiment shown in Figure 2b, the second surface RCM is instead part of another guide member 220Z.

Hence, the link arrangement 200 may include one or more other guide members 210Y and/or 220Z configured to allow the first and second modules L and R to move linearly relative to one another in one or more additional dimensions y and/or z respectively; and in response thereto produce input commands to a computer apparatus. For example, one guide member 210Y may be configured to allow the first module L to move linearly relative to the second module R along directions y having a second orientation being essentially perpendicular to the first orientation. In response to such movements, the link arrangement 200 is configured to produce at least one second command to a computer apparatus, say controlling forward and backward movements in a computer simulated environment.

Additionally, the link arrangement 200 may include a third guide member 220Z configured to allow the first module L to move linearly relative to the second module R along directions z having a third orientation being essentially perpendicular to both the first and second orientations. In response to such movements, the link arrangement 200 is configured to produce at least one third command, say controlling upward and downward movements in a computer simulated environment.

Thus, provided that the link arrangement 200 has a set of guide members including all three of the above-mentioned guide

members 210Y, 220Z and 230X, the first and second modules L and R are allowed to move linearly relative to one another in three dimensions x, y and z. In response thereto, the game control device 100 produces input commands to a computer apparatus, which input commands may represent a subset of all input commands that are producible via the device 100. Namely, as mentioned previously, the device may also contain input members 111, 112, 121, 122, 123 and 124 for producing input commands representing various additional commands/game functions. Figure 3 illustrates a volume 300 within which the first and second modules L and R of the game control device 100 may move relative to one another to produce input commands to a computer apparatus. Here, x_{min} and x_{max} designate end positions of the first guide member 230X, i.e. $x_{max} - x_{min}$ represents the length of the channel/notch in the first orientation. Correspondingly, y_{min} and y_{max} designate end positions of the second guide member 210Y, (and $y_{max} - y_{min}$ represents the length of the channel/notch in the second orientation), and z_{min} and z_{max} designate end positions of the third guide member 220Z, (and $z_{max} - z_{min}$ represents the length of the channel/notch in the third orientation). According to the invention, the distances $x_{max} - x_{min}$, $y_{max} - y_{min}$ and $z_{max} - z_{min}$ may all be equal, so that the volume 300 becomes a cube; or these distances have any other interrelationship, so that the volume 300 becomes a rectangular parallelepiped having any other dimensions.

Furthermore, according to one embodiment of the invention, the link arrangement 200 is configured to allow the first module L to be rotated relative to the second module R around a rotation axis. Figure 4 illustrates this with the rotation axis being equal to the first dimension x. Here, the first guide member 230X contains a housing element 231 and a rod element 232. On one hand, the rod element 232 is configured to be moved linearly into and out from the housing element 231 between the end positions x_{min} and x_{max}. On the other hand, a component RCMα attached to a distal part of the rod element 232 (and further con-

nected to the second module R) is configured to be rotated α_x around the symmetry axis of the rod element 232 (i.e. around the first dimension x). Referring again to Figure 3, this is equivalent to rotating the volume 300 around the x-axis. Naturally, according to the invention, the link arrangement 200 may equally well be configured to allow corresponding rotations around any of the other orientations y and/or z. In any case, the link arrangement 200 is configured to produce input commands to a computer apparatus in response to such rotations α_x.

Figure 5 shows a computer system including the proposed game control device 100. The computer system also includes a computer apparatus 510 and a graphics display unit 520. The computer apparatus 510 may be any kind of general purpose machine, such as a PC, or a dedicated gaming apparatus, e.g. a game console. In either case, the game control device 100 is configured to generate input commands CMD, and forward these commands to the computer apparatus 510 via a communication interface in the device 100.

According to one embodiment of the invention, the communication interface is likewise configured to receive output signals SOUT from the computer apparatus 510. In response to the output signals SOUT, the device 100 is further configured to cause the first module L to move relative to the second module R. The communication interface may be adapted to exchange data related to the input commands CMD and the output signals SOUT with the computer apparatus 510 by wire. However, according to one embodiment of the invention, the device 100 includes a wireless interface, as an alternative or a complement to the wire interface, which wireless interface is configured to forward the input commands CMD to the computer apparatus 510 wirelessly, i.e. by radio, optical signals and/or magnetic inductance.

In order to cause the relative movements between the first and second modules L and R (so that for example various forms of

haptics can be represented), the device 100 includes at least one actuator. The actuator, in turn, preferably includes a linear electric motor, e.g. of voice coil or linear step type, and may be integrated into relevant guide member 230X, 230Y and/or 230Z depending on in which of the first, second and/or third dimensions that the output signals SOUT are to influence. Linear electric motors are advantageous in this context because such motors can be made very compact and yet powerful. It is also relatively easy to integrate position sensors therein, so that a guide member and an actuator for a given dimension constitute a single component.

According to one embodiment of the invention, the device 100 includes a first actuator integrated into the first guide member 230X, which first actuator is configured to in response to at least one first signal SOUT cause the first module L to move linearly relative to the second module R along directions x having the first orientation.

Analogously, according to another embodiment of the invention, the device 100 includes a second actuator integrated into the second guide member 210Y, which second actuator is configured to in response to a second signal output signal SOUT cause the first module L to move linearly relative to the second module R along directions y having a second orientation being essentially perpendicular to the first orientation.

Additionally, according to yet another embodiment of the invention, the device 100 includes third actuator integrated into the third guide member 220Z. The third actuator is configured to in response to a third signal output signal SOUT cause the first module L to move linearly relative to the second module R along directions z having a third orientation being essentially perpendicular to both the first and second orientations.

Moreover, to further enhance the realism of the user interaction with environments simulated by the computer, the device 100

may include at least one angular actuator configured to cause the first module L to rotate relative to the second module R around a rotation axis in response to the output signals SOUT. For example, such an actuator may be represented by a rotary motor integrated into the above-mentioned component RCMα. Thereby, the first module L can be caused to rotate α_x relative to the second module R around the rotation axis x. Naturally, as an alternative or a complement, the link arrangement 200 may be provided with corresponding angular actuators arranged cause rotations around any of the other axes y and/or z.

The term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components. However, the term does not preclude the presence or addition of one or more additional features, integers, steps or components or groups thereof.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any suggestion that the referenced prior art forms part of the common general knowledge in Australia, or in any other country.

The invention is not restricted to the described embodiments in the figures, but may be varied freely within the scope of the claims.

Claims

1. A game control device (100) for generating input commands (CMD) to a computer apparatus (510), the device (100) comprising:

a first module (L) adapted to be held by a first hand of a user,

a second module (R) adapted to be held by a second hand of the user, and

a link arrangement (200) mechanically interconnecting the first and second modules (L; R), the link arrangement (200) being configured to allow the first and second modules (L; R) to move relative to one another while being interconnected, **characterized in that** the link arrangement (200) comprises a set of guide members (230X, 210Y, 220Z) configured to allow the first and second modules (L; R) to move linearly relative to one another in at least one dimension (x, y, z) and in response thereto produce a subset of the input commands (CMD).

2. The device (100) according to claim 1, wherein the link arrangement (200) is configured to:

allow the first module (L) to move linearly relative to the second module (R) along directions (x) having a first orientation, and in response to such movements produce at least one first command of the input commands (CMD), and

allow the first module (L) to move linearly relative to the second module (R) along directions (y) having a second orientation being essentially perpendicular to the first orientation, and in response to such movements produce at least one second command of the input commands (CMD).

3. The device (100) according to claim 2, wherein the link arrangement (200) is configured to allow the first module (L) to move linearly relative to the second module (R) along directions (z) having a third orientation being essentially perpendicular to both the first and second orientations, and in response to such movements produce at least one third command of the input commands (CMD).

4. The device (100) according to any one of the preceding claims, wherein the link arrangement (200) is configured to:

allow the first module (L) to be rotated (α_x) relative to the second module (R) around a rotation axis (x), and

in response to such rotations (α_x) produce a subset of the input commands (CMD).

5. The device (100) according to any one of the preceding claims, wherein the device (100) is configured to receive output signals (SOUT) from the computer apparatus (510) and in response to the output signals (SOUT) cause the first module (L) to move relative to the second module (R).

6. The device (100) according to claim 5, comprising at least one first actuator (230X) configured to, in response to at least one first signal of the output signals (SOUT), cause the first module (L) to move linearly relative to the second module (R) along directions (x) having a first orientation.

7. The game control device (100) according to claim 6, comprising at least one second actuator (210Y) configured to, in response to at least one second signal of the output signals (SOUT), cause the first module (L) to move linearly relative to the second module (R) along directions (y) having a second orientation being essentially perpendicular to the first orientation.

8. The device (100) according to claim 7, comprising at least one third actuator (220Z) configured to, in response to at least one third signal of the output signals (SOUT), cause the first module (L) to move linearly relative to the second module (R) along directions (z) having a third orientation being essentially perpendicular to both the first and second orientations.

9. The device (100) according to any one of claims 6 to 8, wherein at least one of the at least one actuator (230X, 210Y,

220Z) comprises a linear electric motor.

10. The device (100) according to any one of claims 6 to 9, wherein at least one of the at least one actuator is integrated in the set of guide members (230X, 210Y, 220Z).

11. The device (100) according to any one of the preceding claims, comprising at least one angular actuator (RCMα) configured to, in response to the output signals (SOUT), cause the first module (L) to rotate (α_x) relative to the second module (R) around a rotation axis (x).

12. The device (100) according to any one of claims 5 to 11, comprising a communication interface configured to forward the input commands (CMD) to the computer apparatus (510) and receive the output signals (SOUT) from the computer apparatus (510).

13. The device (100) according to claim 12, wherein the communication interface is adapted to exchange data related to the input commands (CMD) and the output signals (SOUT) with the computer apparatus (510) by wire.

14. The device (100) according to any one of the preceding claims, comprising at least one input member (111, 112, 121, 122, 123, 124) configured to be manipulated by the user and in response thereto generate a subset of the input commands (CMD).

15. The device (100) according to any one of the preceding claims, comprising a wireless interface configured to forward the input commands (CMD) to the computer apparatus (510).

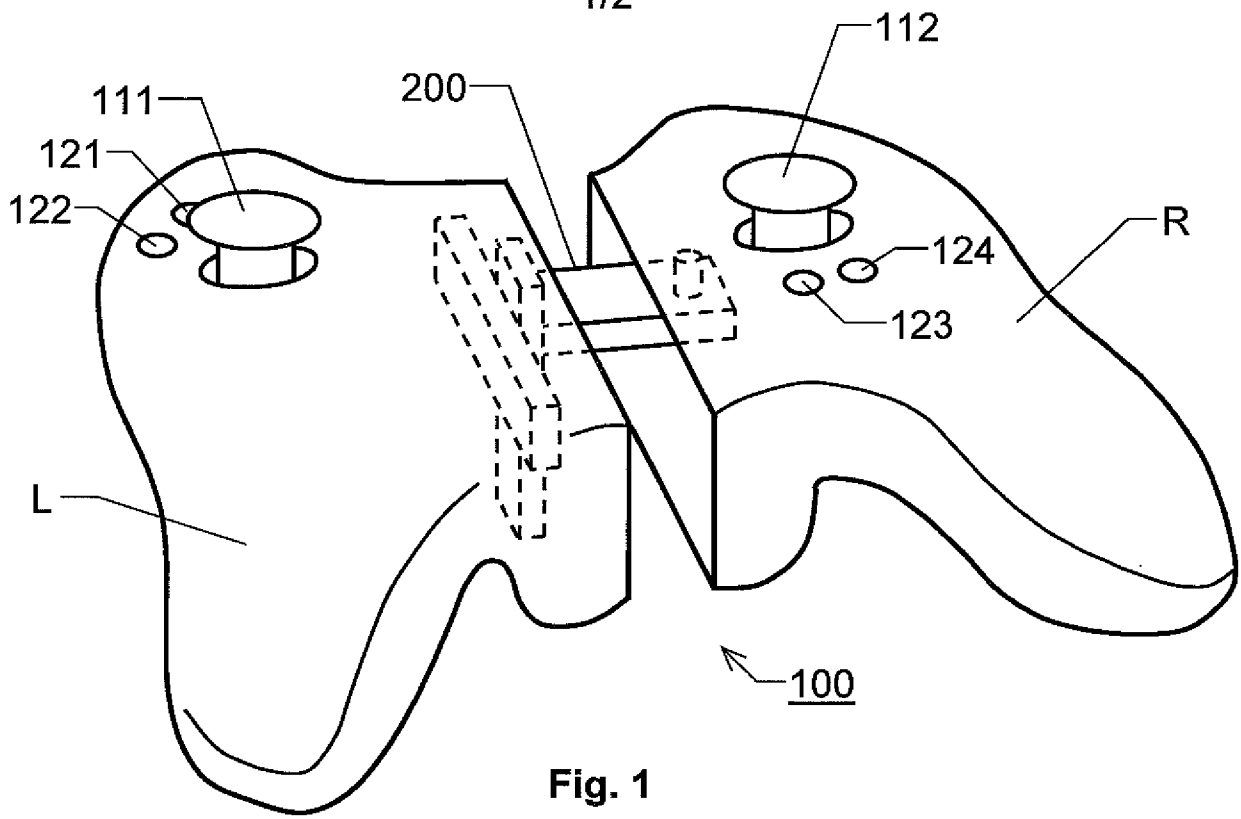

Fig. 1

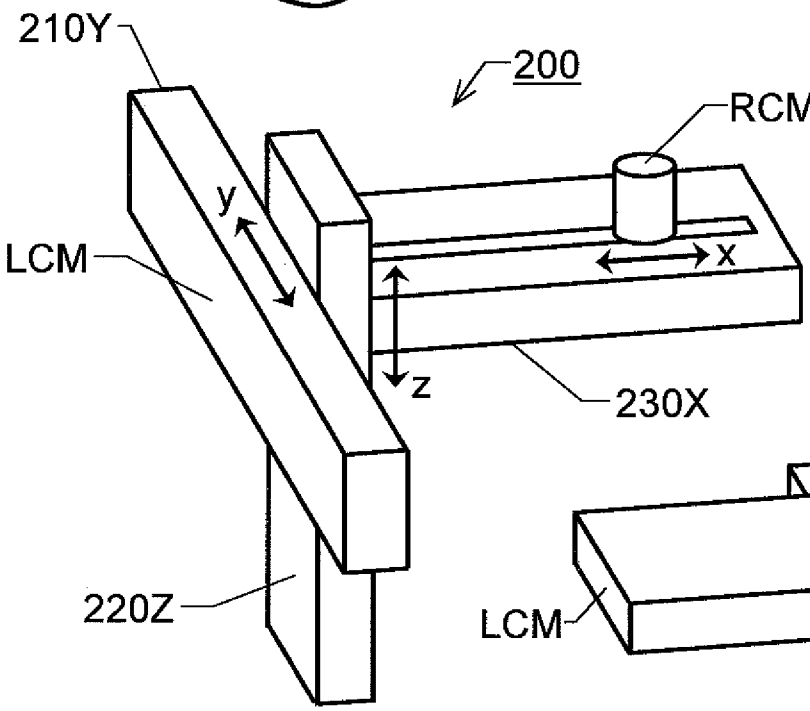

Fig. 2a

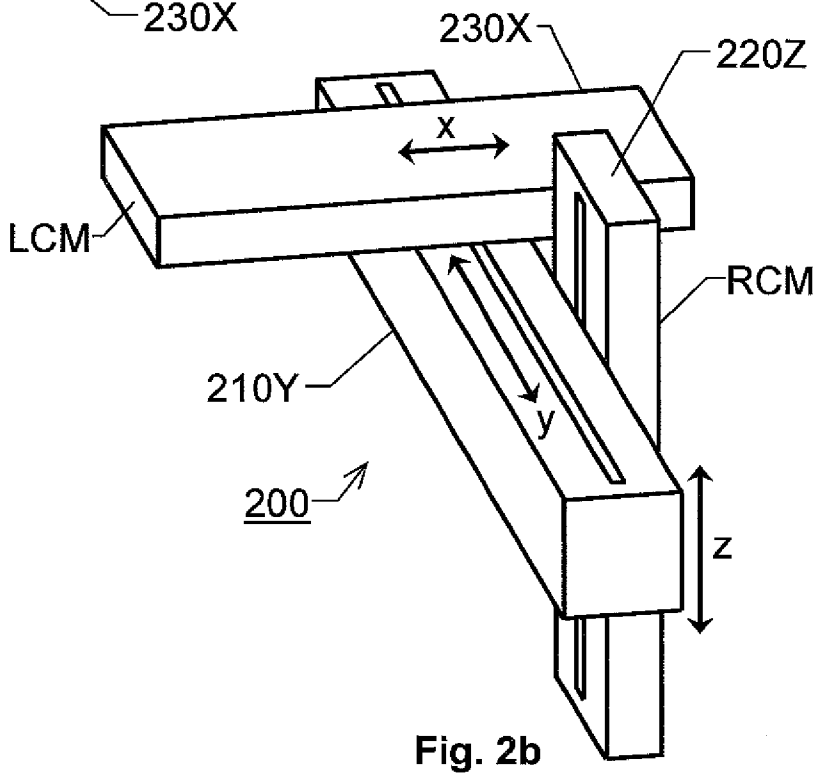

Fig. 2b

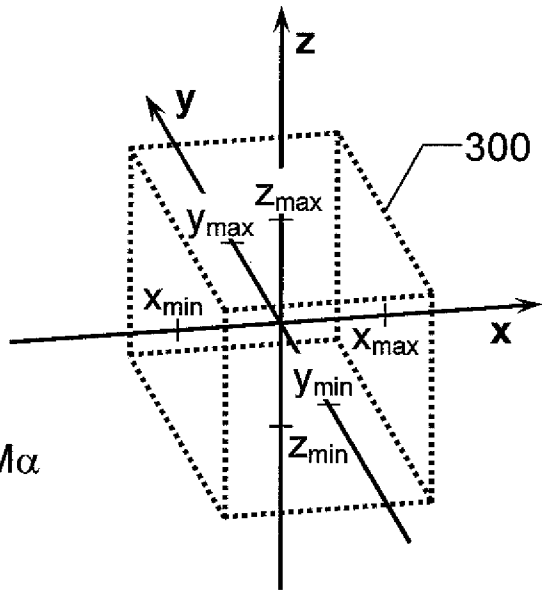

Fig. 3

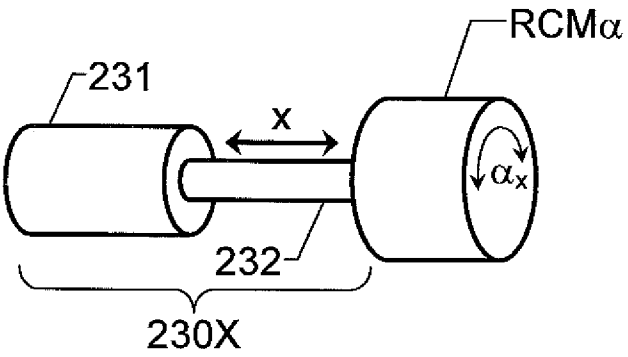

Fig. 4

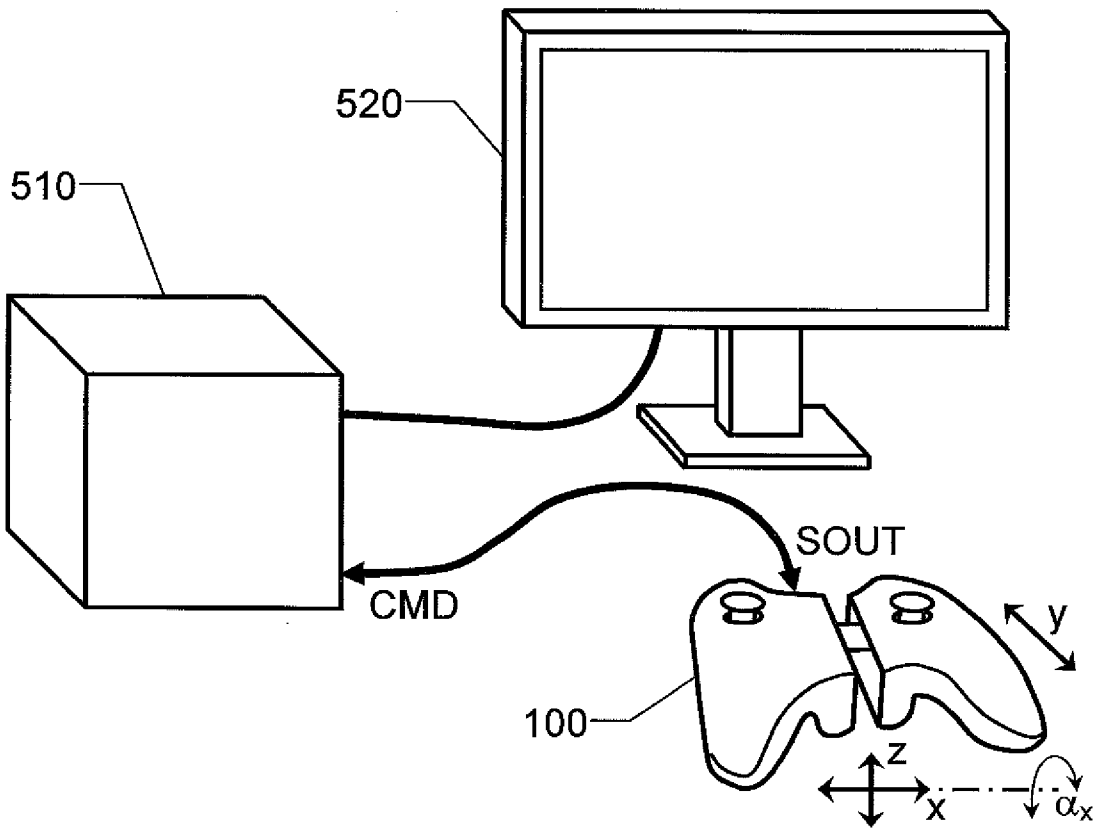

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/051256

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F, A63F, G05G

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

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6614420 B1 (HAN ET AL), 2 Sept 2003 (02.09.2003), abstract ---	1-15
A	JP 2000218041 A, ALPS ELECTRIC CO LTD, 2000-08-08: (abstract) Retrieved from: PAJ database ---	1-15
A	WO 9532776 A1 (NAMCO LTD.), 7 December 1995 (07.12.1995), figures 3,4, abstract ---	1-15
A	US 20060290662 A1 (HOUSTON ET AL), 28 December 2006 (28.12.2006), abstract ---	1-15

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

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Date of the actual completion of the international search	Date of mailing of the international search report
20 July 2010	26 -07- 2010
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Christian Wall / JA A Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2009/051256

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 20070293318 A1 (TETTERINGTON ET AL), 20 December 2007 (20.12.2007), abstract ---	1-15
A	WO 2006084744 A2 (FORCE DIMENSION S.A.R.I.), 17 August 2006 (17.08.2006), abstract ---	1-15
A	WO 2007042758 A1 (NEW CONCEPT GAMING LIMITED), 19 April 2007 (19.04.2007), abstract --- ---	1-15

International patent classification (IPC)

A63F 13/00 (2006.01)
G06F 3/033 (2006.01)
G05G 9/047 (2006.01)

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Cited literature, if any, will be enclosed in paper form.

US	6614420	B1	02/09/2003	CN	1191515	C	02/03/2005
				CN	1264858	A	30/08/2000
				DE	10008025	A	24/08/2000
				FR	2793045	A,B	22/04/2005
				GB	2347484	A,B	16/07/2003
				JP	4298880	B	22/07/2009
				JP	2000311054	A	07/11/2000
				JP	2009151820	A	09/07/2009
				TW	548573	B	21/08/2003
WO	9532776	A1	07/12/1995	JP	8047581	A	20/02/1996
US	20060290662	A1	28/12/2006	NONE			
US	20070293318	A1	20/12/2007	NONE			
WO	2006084744	A2	17/08/2006	CA	2597516	A	17/08/2006
				CN	101180163	A	14/05/2008
				EP	1690652	A	16/08/2006
				JP	2008530459	T	07/08/2008
				US	20080223165	A	18/09/2008
WO	2007042758	A1	19/04/2007	EP	1933961	A	25/06/2008
				GB	2431457	A	25/04/2007
				US	20080214306	A	04/09/2008