(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 April 2013 (11.04.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/052644 A1

(51) International Patent Classification:
A63H 17/385 (2006.01) *A63H 30/04* (2006.01)
A63H 17/39 (2006.01)

(21) International Application Number:
PCT/US2012/058719

(22) International Filing Date:
4 October 2012 (04.10.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/543,033 4 October 2011 (04.10.2011) US

(71) Applicant: **CHILDREN'S MEDICAL CENTER CORPORATION** [US/US]; 55 Shattuck Street, Boston, MA 02115 (US).

(72) Inventors; and
(71) Applicants : **GONZALEZ-HEYDRICH, Joseph** [—/US]; C/o Children's Hospital, 300 Longwood Avenue, Boston, MA 02115 (US). **KAHN, Jason** [—/US]; C/o Children's Hospital, 300 Longwood Avenue, Boston, MA 02115 (US). **DUCHARME, Peter** [—/US]; C/o Children's Hospital, 300 Longwood Avenue, Boston, MA 02115 (US). **ROTENBERG, Alexander** [—/US]; 75 Wolcott Road, Brookline, MA 02467 (US).

(74) Agent: **JOHANNES, Marc, S.**; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210-2206 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(54) Title: EMOTIONAL CONTROL METHODS AND APPARATUS

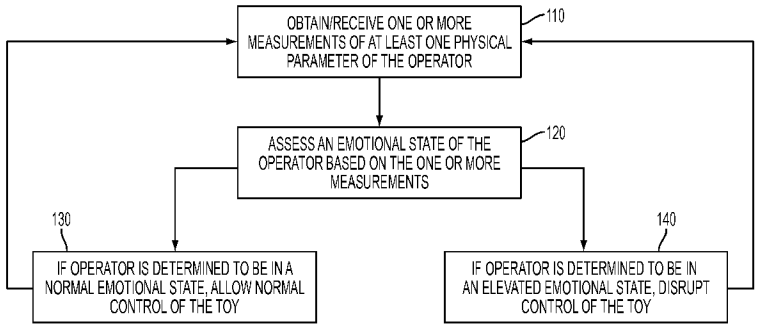

FIG. 1

(57) Abstract: A system including at least one monitor and a toy is disclosed. The at least one monitor may be communicatively coupled to at least one sensor configured to measure at least one physical parameter of an operator. The at least one monitor receives at least one measurement from the at least one sensor indicative of the at least one physical parameter of the operator. The at least one monitor may determine whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement. The toy may be capable of being operated by at least one operator and may comprise a control system in communication with the at least one monitor. The control system may be configured to affect at least one behavior of the toy to cause the toy to be more difficult to use when the monitor indicates that the operator is in an elevated emotional state.

WO 2013/052644 A1

EMOTIONAL CONTROL METHODS AND APPARATUS

BACKGROUND

Children with severe emotional regulation disorders have a specific developmental delay in emotional regulation. As these children grow, levels of aggression acceptable for toddlers become dangerous and unacceptable as they get stronger. Symptoms of aggression can often isolate children both academically and from their peers, leading to intellectual and social deficits that can further exacerbate the aggression. While symptoms of aggression are often apparent from an early age, few young children have developed the cognitive capacity to understand regulation or the motivation to succeed in psychotherapy. Consequently, current clinical treatments, such as cognitive behavioral therapy (CBT), are rarely developmentally appropriate or motivating given the age of the patients involved. Therefore, children with this type of disorder are often put on antipsychotics and mood stabilizers. However, the use of antipsychotic medications to control aggression in children is of concern due to the well documented risks of obesity, type II diabetes, and tardive dyskinesia, among other side effects. Furthermore, for in-patient situations the use of seclusion and restraints is also relied on to control aggressive behavior. However, research has suggested that the use of restraints may result in lasting psychological effects.

SUMMARY

The inventors have recognized that there is a need for a treatment that is conceptually ascertainable by a child, engaging, and does not necessarily involve the use of antipsychotics or restraints. More specifically, the inventors have recognized the benefits of a physical toy that responds to the emotional state of a child in an effort to assist the child in developing mechanisms and responses to cope with their emotions while remaining engaged in an activity.

Some embodiments include an apparatus comprising a physical toy capable of being manipulated and/or interacted with by an operator, at least one monitor communicatively coupled to at least one sensor configured to measure at least one physical parameter of the operator, the at least one monitor configured to receive at least one measurement from the at least one sensor indicative of the at least one physical parameter of the operator, and to determine whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement, and a control system in communication with the at least one monitor,

the control system configured to affect at least one behavior of the toy to cause the toy to be more difficult to use when the monitor indicates the operator is in an elevated emotional state.

Some embodiments include at least on computer-readable storage medium storing instructions that, when executed on at least one processor, perform a method for controlling a physical toy capable of being manipulated and/or interacted with by an operator, the method comprising receiving at least one measurement from at least one sensor configured to measure at least one physical parameter of the operator, the at least one measurement indicative of the at least one physical parameter, determining whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement, and affecting at least one behavior of the toy to cause the toy to be more difficult to use when it is determined that the operator is in an elevated emotional state.

Some embodiments include a method for controlling a physical toy capable of being manipulated and/or interacted with by an operator, the method comprising receiving at least one measurement from at least one sensor configured to measure at least one physical parameter of the operator, the at least one measurement indicative of the at least one physical parameter, determining whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement, and affecting at least one behavior of the toy to cause the toy to be more difficult to use when it is determined that the operator is in an elevated emotional state.

The foregoing and other aspects, embodiments, and features of the present teachings can be more fully understood from the following description in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are not intended to be drawn to scale. For purposes of clarity, not every component may be labeled in every drawing. Various embodiments will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a flow chart of a method for controlling a toy incorporating emotional control, in accordance with some embodiments;

Fig. 2 is a schematic representation of exemplary building material, in the form of a set of blocks, adapted with emotional control capabilities, in accordance with some embodiments;

Fig. 3 is a schematic representation of a remote control vehicle adapted with emotional control capabilities, in accordance with some embodiments;

Fig. 4 is a schematic representation of two remote control vehicles with emotional control capabilities, in accordance with some embodiments;

Figs. 5A & 5B illustrate configurations of emotional controlled toys in accordance with some embodiments;

Figs. 6A-6F illustrate configurations of emotional controlled toys in accordance with some embodiments;

Fig. 7 illustrates an exemplary computer system that may be used to implement one or more components of an emotion controlled system;

Fig. 8 illustrates a remote control vehicle adapted with emotional control, in accordance with some embodiments;

Fig. 9 illustrates an interface between the controller and the remote control unit according to one embodiment of the system illustrated in Fig. 8; and

Fig. 10 illustrates a construction surface adapted with emotional control, in accordance with some embodiments.

DETAILED DESCRIPTION

As discussed above, treatment for pathological aggression may include one or more of cognitive behavioral therapy (CBT), medication and/or restraints. Medication is often an effective treatment, but has undesirable side effects. Furthermore, medication based treatments do not teach the patient emotional regulation skills. Consequently, dysregulated emotional behavior and aggression frequently resurface when the medication is stopped. CBT is a didactic approach that is effective in fostering regulation skills, but this approach requires motivation to practice and learn. CBT also requires a level of cognitive functioning that often does not develop to sufficient levels until a child is 10 to 12 years old. The difficulties with CBT are compounded in children who have developmental disorders, but these children are also at increased risk for developing pathological levels of aggressive behavior.

The inventors have recognized that children with developmental disorders, as well as typically developing preschool and early grade school children, often learn more effectively through exploration by manipulating physical objects in their environment. However, no such

devices currently exist for use in a therapy directed to addressing pathological aggression in children. Consequently, there is a need for toys and/or other appropriate physical or tangible objects (e.g., toys) that children may manipulate and/or interact with to aid in developing and exploring emotion regulation skills.

The inventors previously developed a video game that responded to the emotional state of the player by altering the effectiveness of the firing capability of a computer graphic, such as an avatar of a tank or plane, that the player was capable of controlling in a video game context. However, the inventors recognized that players tend to disconnect from the world and their peers when they are playing a video game. Therefore, a physical or tangible object or toy, as opposed to a non-physical video game, may promote increased interaction with the physical world and a person's peers while learning to regulate emotions during an activity.

The inventors have recognized that a physical system may provide a more effective tool in psychological therapy in this respect. According to some embodiments, the physical system includes a monitor and a toy. A toy refers herein to any one or combination of physical objects/manipulatives, capable of being manipulated and/or interacted with by a user, that is of a physical and/or tangible character. For example, a toy as used herein is to be distinguished from a video game in that, although the system may include a physical controller, the objects/manipulatives being controlled/interacted with (e.g., the one or more computer graphic avatars being controlled/manipulated) are virtual and not physical or tangible in character.

The monitor may be configured to receive measurement(s) from one or more sensors regarding at least one physical parameter of an operator of the toy. The monitor may be configured to evaluate the measurement(s) to determine whether the operator is in a normal or in an elevated emotional state. For example, the monitor may be configured to compare measurement(s) of the at least one physical parameter to a predetermined criteria that is indicative of the operator's emotional state. The monitor may be configured to communicate with a control system of the toy and designed to provide one or more signals indicating whether the operator has reached an elevated emotional state (e.g., whether measurement(s) of the at least one physical parameter meet the predetermined criteria, such as whether the measurement(s) or values derived therefrom exceed a given threshold).

When the monitor indicates to the control system that the operator has reached an elevated state (e.g., when the measurement(s) of the at least one physical parameter meet the predetermined criteria), the control system of the toy may operate to alter the behavior of the toy. More specifically, the control system may affect at least one behavior of the toy to make

the toy more difficult to use. The control system may then return the toy to normal operating behavior when the monitor indicates that the operator has returned to a normal or acceptable emotional state (e.g., indicates that the measurement(s) of the at least one physical parameter no longer meet the predetermined criteria).

It may be advantageous to determine if an operator is in an emotionally elevated state (e.g., angry or frustrated) by evaluating a change in one or more physical parameters of the operator relative to a baseline established while the operator is calm. Autonomic responses indicative of such elevated states such as anger include, but are not limited to, heart rate, heart rate variability, blood pressure, electroencephalogram (EEG) data, pupil dilation, skin temperature, galvanic skin response, perspiration, breathing, etc., or any other appropriate physical parameter and/or parameters derived therefrom that would indicate an emotional state of the operator. Therefore, for purposes of determining an operator's emotional state, one or more sensors may measure at least one of the operator's heart rate, blood pressure, EEG, pupil dilation, skin temperature, perspiration, breathing, etc., and the monitor and/or control system may evaluate the measurement(s) to assess whether the operator is in a normal or elevated state.

According to some embodiments, the measurement(s) of at least one physical parameter include one or more measurements of the heart rate of an operator due to its relative ease of measurement and its generally reliable correlation with elevated emotional states. Heart rate monitoring, or values derived therefrom (e.g., heart rate variability), may be used alone or in combination with other indicators of emotional states. In some embodiments, one or more other physical parameters (e.g., any one or combination of the physical parameters listed above) are measured without using heart rate, as the aspect are not limited for use with any particular type or combination of physical parameters of the operator(s) being monitored. As discussed in further detail below, the one or more sensors, the monitor, the control system and the toy may be separate components, may be integrated, or may be separate and integrated components in any combination, as the aspects are not limited for use with any particular implementation.

Fig. 1 illustrates a method of controlling a toy based on sensory input from an operator engaged with the toy, in accordance with some embodiments. Initially, at least one physical parameter of an operator is measured (e.g., by one or more sensors). For example, as noted above, the at least one physical parameter may include any physical property of the user such as heart rate, blood pressure, electroencephalogram (EEG) data, pupil dilation, skin

temperature, galvanic skin response, perspiration, breathing, etc., either alone or in any combination. In act 110, one or more measurements of the at least one physical parameter is received for assessment of the emotional state of the operator. During act 120, the one more measurements may be evaluated to assess the emotional state of the operator (e.g., to determine whether the operator is in a normal or in an elevated emotional state). For example, the one or more measurements may be evaluated to ascertain whether the one or more measurements (or values derived therefrom) meet a predetermined criteria indicative of the operator's emotional state.

In embodiments using one or more predetermined criteria, the predetermined criteria may include any set of one or more thresholds, values, rules, comparisons, analyses, etc., that, if satisfied, is suggestive of an emotionally elevated state. The one or more measurements may be processed in any manner to evaluate whether they meet the predetermined criteria including, but not limited to, performing one or more comparisons, processing the one or more measurements such as applying one or more algorithms, statistical analyses, transformations, etc., or applying other operations to the one or more measurements to determine whether the predetermined criteria is met or satisfied. As a simple example, the one or more measurements (or one or more values derived therefrom) may be compared to a threshold value to determine whether the operator is believed to be in a normal or elevated emotional state. More sophisticated processing of the measurements to determine whether the one or more measurements indicates a normal or elevated emotional state may be used and the type of analysis performed may depend on the number and type of physical parameters being monitored and analyzed.

If it is determined that the operator being monitored is in a normal or acceptable emotional state (e.g., the one or more measurements do not meet the predetermined criteria), the toy may be operated normally (e.g., the operator may enjoy normal and undisrupted control over the toy), as illustrated by act 130. However, if it determined that the operator being monitored is in an emotionally elevated state (e.g., the operator has become emotionally aroused due to, for example, anger or frustration such that the one more measurements meet the predetermined criteria), the behavior of the toy may be disrupted (e.g., the ability of the operator to control the toy may be impaired), as illustrated in act 140. The operator may continue to be monitored to assess whether the operator is in a normal or in an elevated emotional state. If operation of the toy is being disrupted and it is determined that the operator as regained control over his/her emotions (e.g., the one or more measurements indicates a

normal and/or acceptable emotional state), normal control of the toy may be resumed. Any time that it is determined that the operator has entered an emotionally elevated state (e.g., as assessed in act 120), the control/behavior of the toy may be disrupted (e.g., as illustrated in act 140). Any time that it is determined that the operator is in or has regained a normal emotional state, the operator may be given normal (e.g., undisrupted/unimpaired) control of the toy (e.g., as illustrated in act 130).

In some learning or therapy environments, it may be desirable to configure the disruption or impairment of control of the toy to be dependent on (e.g., related or proportional) the extent of the arousal of the operator (e.g., based on the difference between measurement of the at least one physical parameter and a respective baseline for the operator). Consequently, an operator may receive feedback about their improving or worsening emotional state. That is, the behavior of the toy may be more disruptive under circumstances of increasingly elevated emotional states, and less so with less severe elevations in the emotional state, as indicated by the measurement(s) of the one or more physical parameters. However, in other circumstances, it may be more appropriate or desirable to decouple the extent of the arousal from the severity of the disruption and simply have one or more fixed levels of disruption that are used when it is detected that the operator is in an emotionally elevated state.

FIG. 2 illustrates an emotional control system wherein the toy includes a set of blocks 200, in accordance with some embodiments. In this and other embodiments, one or more sensors 202 may be coupled to the operator to measure one or more physical parameters of the operator indicative of the operator's emotional state. For example, one or more heart rate sensors may be placed on the hands, arms and/or chest of the operator to monitor the heart rate 204 of the operator. Other sensors may also be coupled to the operator or to measure one or more other suitable physical parameters indicative of the operator's emotional state. The one or more sensors may be coupled to the operator either by direct contact with the operator or by measuring one or more physical parameters without direct contact (e.g., by obtaining measurements from a sensor located proximate or located remote from the operator that can detect or otherwise measure the respective one or more physical parameter of the operator).

Prior to or during a first time period illustrated by depiction 206, a baseline for the one or more physical parameters being monitored is obtained. For example, a baseline heart rate 204a may be determined for the operator when the operator is deemed to be in a normal and/or acceptable emotional state to obtain a reference for the system. The operator may then be given instructions to build a structure of a certain shape, arrangement, or height with the

blocks. Alternatively, the operator may simply be allowed to use the blocks as they desire. As long as the operator maintains a heart rate substantially at, or below, the established baseline heart rate the blocks may function as normal blocks. For example, as illustrated in depiction 208, the operator has maintained a heart rate acceptably near the baseline 204a and has built a structure 200a out of the blocks.

However, as shown in depiction 210, once the operator exhibits an elevated emotional state via the measurements from the one or more sensors 202 (e.g., an elevated heart rate 204b that exceeds the baseline 204a by some predetermined amount), the blocks may begin to vibrate as shown in depiction 210. This vibration generally disrupts the operator's ability to construct or build a structure, and may cause the blocks to shift relative to one another or cause a structure to fall down (the latter result of which is shown depiction 212). Once the operator has calmed down, the blocks may return to normal operation as shown by depiction 206.

In some embodiments, the vibration of the blocks may be of a predetermined magnitude independent of the extent of the emotional arousal. Alternatively, the magnitude of the vibrations may be dependent on or otherwise related to the extent or severity of the elevated emotional state (e.g., the disruption of the toy may be proportional to the difference between the elevated heart rate 204b and baseline heart rate 204a). While the measurement of heart rate is depicted in FIG. 2, it should be appreciated that different or additional physical parameters may be monitored and the resulting measurement(s) may be evaluated to determine whether the operator is experiencing an elevated emotional state.

In some embodiments, the building material may be non-vibrating (e.g., the blocks may be conventional blocks) and instead the construction surface, such as a table, may be adapted such that the construction surface vibrates or shakes in response to elevated emotional states to disrupt the construction and/or play using the building material (e.g., blocks), as discussed in further detail below. In other embodiments, both the building material (e.g., blocks) and construction surface (e.g., table) are adapted to vibrate or shake to disrupt the operator's ability to interact with toy, which comprises the building material and construction surface (e.g., blocks and table). It should be appreciated that a vibrating or shaking table may be used as part of a toy in other ways to disrupt play. For example, any number of games can be played on the table such that game play may be disturbed when any monitored participant enters an emotionally elevated state. For example, jacks, pick-up sticks, card games, or other games may be played on the construction surface such that game play may be disrupted by causing the table to vibrate/shake.

Alternatively, or in addition to, vibration, magnetism may be utilized to disrupt play such that when emotionally elevated states are detected via monitoring one or more physical parameters of the user, the blocks and/or table can be induced to repel (or attract) one another to make manipulation and/or construction using the blocks more difficult. Other mechanisms for disrupting building, manipulation or play using the blocks may also be used, as aspects of the invention are not limited in this respect. In embodiments wherein the construction surface provides some component of the disruption, the toy is the physical system comprising the construction surface and the blocks.

As discussed above, other building material may be used in place of or in addition to blocks to build structure. For example, any shaped building material of any type may be used, provided some aspect of either the building material or construction surface may be adapted to disrupt play when elevated emotional states are detected (e.g., Tinkertoys®, Legos®, etc., or even a conventional deck of cards may be used to build structures in connection with a vibrating or shaking table to provide an emotion controlled toy). Furthermore, puzzles may also be used wherein the puzzle pieces are adapted with mechanisms for disrupting constructing or otherwise completing the puzzle (e.g., vibration or magnetism that prevents the puzzle pieces from being joined, or conventional puzzles may be constructed on a vibrating/shaking surface). Other varieties of toys may be used, provided some aspect can be suitably adapted to disrupt use when elevated emotional states are detected, as the aspects are not limited for use with any particular type or combination of toys.

Fig. 3 illustrates a toy that can be used to implement techniques described herein, according to some embodiments. In the embodiment illustrated in Fig. 3, the toy comprises a remote controlled vehicle 300. Remote controlled vehicle 300 may include a controller 320 that allows an operator to control the speed of the vehicle and/or that allows the user to steer vehicle 300. According to some embodiments, when one or more physical parameters, such as heart rate, are within normal levels (e.g., heart rate 304a indicating a normal or controlled emotional state), the controller 320 may allow the operator the full range of speed and/or acceleration capabilities as indicated by speed indicator 350a. When the one or more physical parameters change to indicate an elevated emotional state (e.g., elevated heart rate 304b), the controller 320 may disrupt control of the vehicle by slowing the vehicle, preventing faster speeds to be reached, decreasing the acceleration capability of the vehicle and/or otherwise disrupting optimal control/performance of the vehicle. In some embodiments, the controller may disrupt the steering of the vehicle when elevated emotional states are detected via

monitoring the one or more physical parameters of the operator to impair the operator's ability to control the vehicle.

Competitive activities may induce or heighten an emotional state of a child exhibiting pathological aggression. Consequently, it may be advantageous to link the ability of the operator to control their emotions to their ability to continue to engage in a competitive environment or activity. Therefore, in some embodiments, the toy may be used in a competitive environment to potentially enhance the therapeutic value of the play. In connection with an emotion control system involving building materials and/or a construction surface, participants may be asked to compete in building a structure. For example, the participants may be instructed to race to build a structure of a certain height, or compete to build the tallest structure. In other examples, participants may be asked to alternatively remove elements from a structure without causing the structure to fall as in the familiar game of Jenga®, wherein either the elements of the structure are adapted to vibrate/shake and/or the construction surface on which the structure is built is configured to vibrate/shake when monitored participants are determined to be in an emotionally elevated state.

FIG. 4 illustrates a competitive environment involving an emotion controlled toys comprising remote control vehicles 400a and 400b, which are located on a race track 402. The two remote control vehicles 400a and 400b are associated with remote controls 404a and 404b, respectively. Sensors 406a and 406b may monitor one or more physical parameters (e.g., heart rate, EEG, galvanic skin response, pupil dilation, etc.) of the respective operators as they engage in driving remote control vehicles. In a circumstance wherein the one or more physical parameters includes heart rate, Operator A has a heart rate 408a that is within an acceptable range of closeness to Operator A's baseline heart rate such that Operator A is deemed to be in an emotionally acceptable state and is given undisrupted control of vehicle 400a. Operator B has a heart rate 408b that exceeds Operator B's baseline heart rate by an amount deemed indicative of an elevated emotional state of Operator B (e.g., anger or frustration).

According to some embodiments, the vehicles may slow, stop, or otherwise become more difficult to operate when it is determined that the operator is experiencing an emotionally elevated state. For example, Operator A may be permitted to control vehicle 400a normally without impairment (e.g., vehicle 400a may be driven at its maximum speed as indicated by the arrow). However, since Operator B's heart rate indicates that he/she is experiencing elevated emotions, vehicle 400b may only proceed around track 402 at a reduced speed, as indicated by the smaller arrow, until Operator B is able to control his/her emotions and return

heart rate 408b back to a rate that is acceptably near the baseline rate. The reduction in speed may depend on the severity of the elevated emotions as indicated by the difference between the Operator B's measured physical parameter(s) and a baseline for Operator B, or the reduction in speed may remain fixed even as the emotional arousal heightens or lifts, until such time as Operator B is deemed to have returned to a normal or acceptable emotional state and optimal speed control returned to Operator B. The disruption to Operator B's vehicle is not limited to speed reduction and may include disruption by the controller in Operator B's ability to steer or otherwise control the operation of the vehicle.

Clinical insight suggests that pathologically aggressive children often loose emotional control and become aggressive and/or angry when they are challenged with a complex, social, and potentially frustrating tasks. Therefore, it is desirable that the therapeutic training would motivate them to practice regulating their emotional arousal in the face of increasingly difficult cognitive and social demands. For example, the child may be asked to perform a series of increasingly difficult tasks with a toy incorporating the emotional control system disclosed herein. One such series of tasks may involve the use of building materials (e.g., blocks, cards, Tinkertoys®, Legos®, Duplos®, etc.) and/or a construction surface as described above. The child may be asked to build increasingly complex and difficult structures, or patterns, with the building material. In some embodiments, the child may be asked to navigate an increasingly difficult course with a remote control vehicle. In either case, the toys and activities may be designed to push the child to the point where they would need to control their emotions and then provide a physical indication of their emotional state as indicated by the behavior of the toys.

Team activities also provide a stressor for a child exhibiting pathological aggression since it requires interpersonal interactions and communication that may challenge and/or frustrate the child. Therefore, it may be desirable to use a toy, or toys, implementing the presently disclosed emotion based control in a team based environment. In such a toy, the physical parameters of a single operator, or multiple operators, may be measured. In some embodiments, the emotional state of each operator may be used to affect the overall behavior of the toy. Alternatively, each team member may be responsible for one aspect of the toy's operation. In such an embodiment, the emotion based control may affect separate aspects of the toys operation based on the emotional state of the individual operator responsible for those particular aspects of the toy's behavior.

In other embodiments, instead of attaching separate sensors to an operator, it may be desirable to incorporate sensors for measuring the physical parameter of the operator into the toy itself. Such an embodiment may help to promote a more natural interaction between a child and the toy since there is no need for possibly intrusive sensors to be placed on the child. For example, the remote control vehicle disclosed above may incorporate a sensor for measuring a heart rate directly into the remote control. While incorporated sensors have been described with regards to a remote control, it should be understood that integrated sensors may be implemented in other embodiments to exploit possible benefits of incorporating one or more sensors directly into a toy without the need for additional external sensors.

In some instances, it may be desirable to determine a rate of change in the physical parameter of the patient to enable the emotional control based system to warn the operator prior to them losing their temper or losing control and entering an emotionally elevated state. If the rate of change in the physical parameter indicates that the predetermined criteria may be met immanently, the toy may emit an indication of this to the operator. For example, the toy may emit an audible tone, turn on an indicator light, affect the behavior of the toy to a lesser degree, or any other appropriate action that may indicate that an operator is about to reach an emotionally elevated state. By providing an earlier indication, it may be possible for the operator to alter their emotional state prior to becoming angry and/or disrupting or more critically impairing the operating behavior of the toy.

Figs. 5A and 5B illustrate examples of locating a monitor relative to the control system of a toy, according to some embodiments. In some embodiments, the monitor 500 may be placed external to the toy 504. An external control system 502 may be placed in communication with monitor 500 and internal control system 506 of toy 504. External control system 502 may analyze a signal from monitor 500 regarding the at least one physical parameter to determine the emotional state of the operator. External control system 302 may then communicate a signal to internal control system 506 indicative of the emotional state of the operator.

Alternatively, the external control system may simply communicate a signal to internal control system 506 indicating whether or not to disrupt the behavior of the toy to make it more difficult to operate. Communications between the monitor, external control system, and internal control system are indicated by the arrows in Fig. 5A. Communications may be provided by wired or wireless connections, as the aspects are not limited for use with any particular type of communication between components of the system. According to some

embodiments, as depicted in Fig. 5B, a monitor 508 and internal control system 510 may be disposed within the housing of a toy 512, or may otherwise be integrated with the toy. In such embodiments, there may be no need for a separate system or component to measure the one or more physical parameters and communicate them to the internal control system of the toy. Instead, monitor 508 located within the toy may directly communicate with the internal control system 510, and in some cases may be integrated into a single control component implemented in software and/or hardware.

Figs. 6A-6F illustrate further configurations of emotion control systems comprising one or more sensors 605 that measure at least one physical parameter of an operator, a monitor 610 to determine whether an operator is in a normal or elevated emotional state based on signals from sensor(s) 605, a control system 620 to control toy 600 based, at least in part, on the indication of the emotional state of the operator provided by monitor 610. In Fig. 6A, sensor(s) 605 and monitor 610 are integrated with control system 620 to control a toy via control signals 625 (the toy itself of which may have an internal controller to provide appropriate control over the toy based on signals received from control system 620).

As one example, the controller for a remote control vehicle may have integrated heart rate sensors located where the operator holds the controller to measure heart rate as the operator controls the vehicle. The monitor and control system may also be integrated in the controller to provide indication of the emotional state of the operator such that the controller can decide whether to provide normal control signals to the vehicle based on the operator's manipulation of the controller, or whether to disrupt the control of the vehicle in any of the ways described in the foregoing description. Fig. 6B illustrates a configuration wherein the sensor(s) 605 are not integrated with the control system 620 and are provided external to the control system 620 (e.g., positioned as necessary on or proximate the operator) to provide signals 615 (e.g., signal comprising measurements of one or more physical parameters of the operator) to control system 620 indicative of the at least one physical parameter of the operator. Such signals may be provided via wired or wireless connections between the components.

Figs. 6C and 6D illustrate configurations wherein the monitor 610 is provided separate from (e.g., is not integrated with) the control system 620. In Fig. 6C, sensor(s) 605 and monitor 610 are integrated together to provide signals 635 indicative of the operator's emotional state to control system 620 (e.g., signals indicating whether the operator is in an emotionally normal or elevated state and/or instructions to operate the toy normally or in a

disrupted manner). The control system 620 may then control toy 600 normally or control toy in a disrupted manner based on signals 635 using control signals 625. In Fig. 6D, sensor(s) 605 are provided separate from the monitor 610 and provide signals 615, either via wired or wireless connection, to the monitor 610 that include measurements or are otherwise indicative of the at least one physical parameter of the operator for assessment by the monitor 610 of the emotional state of the operator.

Figs. 6E and 6F illustrate configurations wherein the control system 620 is integrated with the toy. In Fig. 6E, sensor(s) 605 and monitor 610 are integrated together to provide signals 635 to the toy indicative of the operator's emotional state and/or that provide instructions to control system 620 regarding how to operate the toy. The control system 620 integrated with the toy may receive signals 635 and control toy 600 normally or control toy in a disrupted manner based on signals 635. The control system 620 may either directly control the toy 600 via internal electronics, or may communicate with an embedded controller of toy 600. In Fig. 6F, sensor(s) 605 are provided separate from the monitor and provide signals 615, either via wired or wireless connection, to the monitor 610 that include measurements or are otherwise indicative of the at least one physical parameter of the operator for evaluation by monitor 610 to assess the emotional state of the operator. Monitor 610 provides signals 635 indicative of the emotional state of the operator determined from the at least one physical parameters measured by sensor(s) 605 and/or that include instructions to control system 620 integrated with toy 600 via either wired or wireless communications to instruct control system 620 to operate toy 600 normally or in a disrupted manner.

It should be appreciated that other configurations of sensor(s), monitor(s), control systems(s) and toy(s) may be used, as the aspects of the invention are not limited for use with any particular implementation. Components of the exemplary systems described herein may be implemented in any way, including microcontrollers, application specific integrated circuits (ASICS), field programmable gate arrays (FPGA's), computer systems executing software, firmware, microcode, etc., or any combination of software and/or hardware suitable for implementing techniques described herein.

An illustrative implementation of a computer system 700 that may be used to implement any one or combination of components of an emotional control system (e.g., one or any combination of sensors, a monitor, control system, etc.) is shown in FIG. 7. Computer system 700 may include one or more processors 710 and one or more non-transitory computer-readable storage media (e.g., memory 720 and one or more non-volatile storage media 730).

The processor 710 may control writing data to and reading data from the memory 720 and the non-volatile storage device 730 in any suitable manner, as the aspects of the invention described herein are not limited in this respect. To perform functionality and/or techniques described herein, the processor 710 may execute one or more instructions stored in one or more computer-readable storage media (e.g., the memory 720, storage media, etc.), which may serve as non-transitory computer-readable storage media storing instructions for execution by the processor 710. Computer system 700 may also include any other processor, controller or control unit needed to route data, perform computations, perform I/O functionality, etc.

In connection with the monitoring and/or control techniques described herein, one or more programs that evaluate data (e.g., data from the one or more sensors), make one or more determinations (e.g., determine or assess the emotional state of an operator, determine what control mechanism to propagate based on whether the toy should be controlled in normal or disrupted mode, etc.), and/or generate control signals may be stored on one or more computer-readable storage media of computer system 700. Processor 710 may execute any one or combination of such programs that are available to the processor by being stored locally on computer system 700 or accessible over a network. Any other software, programs or instructions described herein may also be stored and executed by computer system 700. Computer 700 may be a programmable microcontroller, standalone computer, mobile device, etc., and/or may be configured to communicate with other devices, either via a wired or wireless connection, or may be configured to connect to a network and access resources over the network and/or communicate with one or more other computers connected to the network.

Provided below are additional details regarding a number of example implementations of emotional state monitoring systems. Some implementations comprise a device (e.g., one or more sensors) connected physiologically to the operator to measure at least one physical parameter or characteristic of the operator, a device/computer (e.g., a monitor) to read the physiological data and interpret it, and a device/computer (e.g., control system) to interface with the physical manipulative (e.g., toy) to provide changes in the manipulative's behavior based on changes in emotional state (e.g., to disrupt the behavior of the manipulative when an emotionally aroused or elevated state is detected.

As discussed above, there are numerous ways to measure changes in emotional state, including, but not limited to, heart rate, heart rate variability, galvanic skin response, analysis of EEG data, etc. The specifics of an interface to the manipulative/toy may be different based on the type of manipulative/toy being controlled (e.g., remote control vehicle, blocks, puzzle,

construction surface, etc.). For example, the interface for a remote control vehicle implementation may contain control outputs for forward, reverse, left, right, speed, acceleration, etc., while the interface for a construction surface (e.g., a vibrating or shaking table) may contain one control determining whether the surface is vibrating/shaking or not, or may include an additional control indicating the intensity of the vibrating/shaking.

Fig. 8 illustrates an implementation of an emotionally controlled remote control vehicle system, according to some embodiments. The system comprises one or more sensors 805, including a heart rate sensor, a monitor 810 (e.g., a computer similar to the computer system 700 illustrated in FIG. 7) to collect sensor data (e.g., via signals 815 received from sensor(s) 805) including heart rate information and to assess the information, and relay information (e.g., via signals 835) to a control system 820. The emotional control system further comprises a remote controlled vehicle, including a remote control unit 824 as part of the control system 820, and a vehicle unit 800 wirelessly controlled by remote control 824 (e.g., via radio frequency (RF) communication).

Control system 820 comprises a controller 822 having a processor, a USB input connection, power output connected to the vehicle's remote control unit 824, digital outputs 845 to send signals to the remote control unit 824 corresponding to moving the vehicle forward, moving the vehicle backward, turning the vehicle left, and turning the vehicle right, and a plurality of transistors to act as switches overriding normal control when emotionally elevated states are detected. Controller 822 may be implemented in any way that is suitable for disrupting control or otherwise impairing the operator's ability to control the toy. According to some embodiments, controller 822 may be implemented using an Arduino platform, providing an ATMEGA processor, digital output pins, and USB interface.

Monitor 810 may execute software that obtains sensor data 815, including heart rate information, over a Bluetooth connection to compute RR heart rate variability. The software may be adapted to be indifferent to the source of heart rate information. Heart rate data could also be provided over audio (e.g., via a USB connection), or any other input port available to monitor 810. Software executed by monitor 810 may be configured to keep track of the operator's threshold heart rate. Threshold heart rate may be set prior to or at the beginning of the operator's interaction with the toy (e.g., the remote control vehicle in this embodiment). When threshold heart rate is exceeded by some designated amount, then the operator is considered to be emotionally aroused. When the monitor detects emotional arousal based on sensor signal(s) 815, the monitor alerts controller 822 of the control system 820 of a change in

emotional state by signaling the change over a USB connection between the monitor and the controller. While a USB connection is used between the monitor and the controller in this particular example, connections between components in the system are not limited to any particular type of connection or connection protocol.

Controller 822 and remote control unit 824 may be connected using any type of connection such as an internal bus system, electronics, embedded controls, etc. According to some embodiments, controller 822 is connected to control unit 824 via a series of transistors that operate as switches such that when controller 822 is informed of a change in the emotional state of the operator, controller 822 can provide signals at its digital outputs to disrupt the operation of the remote control vehicle 800. Fig. 9 illustrates an exemplary connection between controller 822 and remote control unit 824 that facilitates overriding the steering and/or acceleration of the vehicle when an emotionally elevated state is detected.

Under normal operation, when controls are manipulated on the remote control unit 824, a corresponding short circuit provides a connection to ground, causing the remote control unit 824 to send the desired signal to the vehicle unit 800. As shown in Fig. 9, transistors may be placed at the physical switch to provide an electronic switch for each of the desired control lines. When the controller 822 turns on a desired transistor, the corresponding control is shorted and the remote control unit 824 sends the signal desired by the controller 822 to control the vehicle unit 800.

As such, using the above described override, software provided on monitor 810 (or in some embodiments, software provided on controller 822) determines whether the operator is in an emotionally normal or elevated state based on the measurements obtained by sensor(s) 805. When monitor 810 determines that the operator is in an emotionally elevated state, it signals the controller 822 to disrupt control of the vehicle. Software on controller 822 may be configured to disrupt control the vehicle in any number of different ways and to any level of desired disruption, including causing the vehicle to stop completely, move slowly and/or move randomly via digital outputs 845. In this way, software may be configured to provide different types of disruption, the severity of which may be related to the severity of the elevation in the operator's emotional state. However, the severity of the disruption need not vary as function of the extent of the emotional arousal, and may simply operate in normal or disrupted mode based on whether or not the operator being monitored is determined to be in an emotionally elevated state.

Fig. 10 illustrates an implementation of an emotionally controlled table that can be used as a playing or construction surface, in accordance with some embodiments. The system includes one or more sensors 1005 and a monitor 1010 to obtain sensor information from sensor(s) 1005. In this embodiment, monitor 1010 is integrated with control system 1020 to determine when the operator is emotionally aroused and to provide control signals to disrupt play/construction on table 1000. Table 1000 includes, or has attached to it, a vibrating motor (e.g., a ¼ horse power, 185 watt motor) for causing the table to shake to disturb the action taking place at the table. Sensor(s) 1005 may communicate with the control system 1020 via a wireless connection such as an RF communication link. The control system 1020 may operate off of a 9 volt source and include one or more processors, an RF receiver, and an output to control the state of a solid state relay 875. The relay 875 may switch on and off 120 VAC power (e.g., wall power) to the motor depending on the state into which it is placed by the control system 1020.

In operation, one or more participants (operators) may be engaged in an activity on the table, such as any cognitive task that makes use of the table surface. For example, the participants may be building a structure out of blocks or any other type of building material, may be engaged in a game, or may be assembling a puzzle. When the target participant(s) being monitored by the system are in an emotionally stable state, the table may remain still, thus allowing the participants to optimally perform their activities and/or achieve their tasks. When the monitor 1010 detects that any of the target participant(s) (i.e., any of the participants being monitored) has entered an emotionally elevated state, the control system 1020 disrupts the activity by causing the relay to provide power to the motor. The motor shakes or vibrates the table to make the task being performed and/or activity being conducted on the table more difficult. When the monitor detects that the target participant(s) have returned to an emotionally normal state, the control system 1020 signals normal operation by turning the relay off such that power is no longer provided to the motor. It should be appreciated that table 1000 may be any suitable surface such as a mat, a rigid surface of any material, or other type of surface that can be configured to shake or vibrate to disrupt use, as the aspect in this respect are not limited to any particular type or surface on which activity may be conducted.

While the present teachings have been described in conjunction with various embodiments and examples, it is not intended that the present teachings be limited to such embodiments or examples. On the contrary, the present teachings encompass various alternatives, modifications, and equivalents, as will be appreciated by those of skill in the art.

Accordingly, the foregoing description and drawings are by way of example only. While certain embodiments have been described using particular configurations, it should be appreciated that any emotional control system may be implemented using any of the configurations illustrated in Figs. 5A and 5B and/or Figs. 6A-6F, or any other suitable configuration that allows for control of a manipulative based on the emotional state of an operator, as the aspects of the invention are not limited for use with any particular configuration or implementation.

The above-described embodiments can be implemented in any of numerous ways. For example, the monitor and/or control features and mechanisms can be implemented using hardware, software or a combination thereof. When implemented in software, the software code may be executed on any suitable processor or collection of processors to provide the above disclosed control functionality. The various measurement, analysis and/or control methods or processes outlined herein may be coded as software that is executable on one or more processors. Additionally, such software may be written using any of numerous suitable programming languages and/or programming or scripting tools, and also may be compiled as executable machine language code or intermediate code.

In this respect, various inventive concepts may be embodied as at least one non-transitory computer readable storage medium (e.g., a computer memory, one or more floppy discs, compact discs, optical discs, magnetic tapes, flash memories, circuit configurations in Field Programmable Gate Arrays or other semiconductor devices, etc.) encoded with one or more programs that, when executed on one or more computers or other processors, implement the various embodiments of the present invention. The non-transitory computer-readable medium or media may be transportable, such that the program or programs stored thereon may be loaded onto any computer resource to implement various aspects of the present invention as discussed above. The use of the term computer readable storage medium reflects that the medium is an article of manufacture and therefore also non-transitory.

The terms “program” or “software” are used herein in a generic sense to refer to any type of computer code or set of computer-executable instructions that can be employed to program a computer or other processor to implement various aspects of embodiments as discussed above. Additionally, it should be appreciated that according to one aspect, one or more computer programs that when executed perform methods of the present invention need not reside on a single computer or processor, but may be distributed in a modular fashion among different computers or processors to implement various aspects of the present

invention. Computer-executable instructions may be in many forms, such as program modules, executed by one or more computers or other devices. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Typically the functionality of the program modules may be combined or distributed as desired in various embodiments.

Also, various inventive concepts may be embodied as one or more methods, of which an example has been provided. The acts performed as part of the method may be ordered in any suitable way. Accordingly, embodiments may be constructed in which acts are performed in an order different than illustrated, which may include performing some acts simultaneously, even though shown as sequential acts in illustrative embodiments.

The indefinite articles "a" and "an," as used herein in the specification and in the claims, unless clearly indicated to the contrary, should be understood to mean "at least one." As used herein in the specification and in the claims, the phrase "at least one," in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase "at least one" refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, "at least one of A and B" (or, equivalently, "at least one of A or B," or, equivalently "at least one of A and/or B") can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

The phrase "and/or," as used herein in the specification and in the claims, should be understood to mean "either or both" of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Multiple elements listed with "and/or" should be construed in the same fashion, i.e., "one or more" of the elements so conjoined. Other elements may optionally be present other than the elements specifically identified by the "and/or" clause, whether related or unrelated to those elements

specifically identified. Thus, as a non-limiting example, a reference to "A and/or B", when used in conjunction with open-ended language such as "comprising" can refer, in one embodiment, to A only (optionally including elements other than B); in another embodiment, to B only (optionally including elements other than A); in yet another embodiment, to both A and B (optionally including other elements); etc.

As used herein in the specification and in the claims, "or" should be understood to have the same meaning as "and/or" as defined above. For example, when separating items in a list, "or" or "and/or" shall be interpreted as being inclusive, i.e., the inclusion of at least one, but also including more than one, of a number or list of elements, and, optionally, additional unlisted items. Only terms clearly indicated to the contrary, such as "only one of" or "exactly one of," or, when used in the claims, "consisting of," will refer to the inclusion of exactly one element of a number or list of elements. In general, the term "or" as used herein shall only be interpreted as indicating exclusive alternatives (i.e. "one or the other but not both") when preceded by terms of exclusivity, such as "either," "one of," "only one of," or "exactly one of." "Consisting essentially of," when used in the claims, shall have its ordinary meaning as used in the field of patent law.

Use of ordinal terms such as "first," "second," "third," etc., in the claims to modify a claim element does not by itself connote any priority, precedence, or order of one claim element over another or the temporal order in which acts of a method are performed. Such terms are used merely as labels to distinguish one claim element having a certain name from another element having a same name (but for use of the ordinal term).

The phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," "having," "containing", "involving", and variations thereof, is meant to encompass the items listed thereafter and additional items.

Having described several embodiments of the invention in detail, various modifications and improvements will readily occur to those skilled in the art. Such modifications and improvements are intended to be within the spirit and scope of the invention. Accordingly, the foregoing description is by way of example only, and is not intended as limiting. The invention is limited only as defined by the following claims and the equivalents thereto.

What is claimed is:

CLAIMS

1. An apparatus comprising:

a toy capable of being manipulated and/or interacted with by an operator;

at least one monitor communicatively coupled to at least one sensor configured to measure at least one physical parameter of the operator, the at least one monitor configured to receive at least one measurement from the at least one sensor indicative of the at least one physical parameter of the operator, and to evaluate whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement; and

a control system in communication with the at least one monitor, the control system configured to affect at least one behavior of the toy to cause the toy to be more difficult to use when the monitor indicates that the operator is in an elevated emotional state.

2. The apparatus of claim 1, wherein the toy comprises a remote controlled vehicle, and wherein the control system is configured to affect at least one of speed, acceleration and steering of the vehicle.

3. The apparatus of claim 1, wherein the toy comprises a construction surface, and wherein the control system is configured to vibrate the construction surface when the at least one measurement is determined to meet the predetermined criteria.

4. The apparatus of claim 3, wherein the toy further comprises at least one of building material to construct a structure on the construction surface and a game to be played on the construction surface.

5. The apparatus of claim 1, wherein the toy comprises building material, and wherein the control system is configured to affect at least one behavior by at least one of vibrating the building material and affecting the magnetism of the building material.

6. The apparatus of claim 5, wherein the building material includes blocks.

7. The apparatus of claim 1, wherein the at least one monitor and the control system form an integrated component.

8. The apparatus of claim 1, wherein the at least one monitor and the control system form separate components.

9. The apparatus of claim 1, wherein the apparatus further comprises the at least one sensor, and wherein the at least one sensor and the at least one monitor form an integrated component.

10. The apparatus of claim 1, wherein the apparatus further comprises the at least one sensor, and wherein the at least one sensor and the at least one monitor form separate components.

11. The apparatus of claim 1, wherein the at least one sensor measures at least one of heart rate, blood pressure, electroencephalogram (EEG) information, pupil dilation, temperature, galvanic skin response, perspiration and breathing.

12. The apparatus of claim 1, wherein the monitor is configured to determine whether the at least one measurement meets a predetermined criteria to evaluate whether the user is in an elevated emotional state, and wherein the control system is configured to affect the at least one behavior of the toy when the at least one measurement is determined to meet the predetermined criteria.

13. The apparatus of claim 12, wherein the predetermined criteria includes a threshold and the behavior of the toy is affected when the at least one measurement exceeds the threshold.

14. At least on computer-readable storage medium storing instructions that, when executed on at least one processor, perform a method for controlling a toy capable of being manipulated and/or interacted with by an operator, the method comprising:

receiving at least one measurement from at least one sensor configured to measure at least one physical parameter of the operator, the at least one measurement indicative of the at least one physical parameter;

determining whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement; and

affecting at least one behavior of the toy to cause the toy to be more difficult to use when it is determined that the operator is in an elevated emotional state.

15. The at least one computer readable medium of claim 14, wherein the toy comprises a remote controlled vehicle, and wherein affecting at least one behavior comprises affecting at least one of speed, acceleration and steering of the vehicle.

16. The at least one computer readable medium of claim 14, wherein the toy comprises a construction surface, and wherein affecting at least one behavior comprises vibrating or shaking the construction surface when the at least one measurement is determined to meet the predetermined criteria.

17. The at least one computer readable medium of claim 16, wherein the toy further comprises at least one of building material to construct a structure on the construction surface and a game to be played on the construction surface.

18. The at least one computer readable medium of claim 14, wherein the toy comprises building material, and wherein affecting at least one behavior comprises affecting at least one behavior by at least one of vibrating or shaking the building material and affecting the magnetism of the building material.

19. The at least one computer readable medium of claim 18, wherein the building material includes blocks.

20. The at least one computer readable medium of claim 14, wherein receiving at least one measurement comprises receiving at least one measurement indicative of at least one of heart rate, blood pressure, electroencephalogram (EEG) information, pupil dilation, temperature, galvanic skin response, perspiration and breathing.

21. The at least one computer readable medium of claim 14, wherein determining whether the operator is in an elevated emotional state includes determining whether the at least one measurement meets a predetermined criteria indicative of the operator's emotional state, and

wherein affecting the at least one behavior of the toy is performed when the at least one measurement is determined to meet the predetermined criteria.

22. The at least one computer readable medium of claim 21, wherein the predetermined criteria includes a threshold and wherein affecting at least one behavior comprises affecting at least one behavior when the at least one measurement exceeds the threshold.

23. A method for controlling a toy capable of being manipulated and/or interacted with by an operator, the method comprising:

receiving at least one measurement from at least one sensor configured to measure at least one physical parameter of the operator, the at least one measurement indicative of the at least one physical parameter;

determining whether the operator is in an elevated emotional state based, at least in part, on the at least one measurement; and

affecting at least one behavior of the toy to cause the toy to be more difficult to use when it is determined that the operator is in an elevated emotional state.

24. The method of claim 23, wherein the toy comprises a remote controlled vehicle, and wherein affecting at least one behavior comprises affecting at least one of speed, acceleration and steering of the vehicle.

25. The method of claim 23, wherein the toy comprises a construction surface, and wherein affecting at least one behavior comprises vibrating or shaking the construction surface when the at least one measurement is determined to meet the predetermined criteria.

26. The method of claim 25, wherein the toy further comprises at least one of building material to construct a structure on the construction surface and a game to be played on the construction surface.

27. The method of claim 23, wherein the toy comprises building material, and wherein affecting at least one behavior comprises affecting at least one behavior by at least one of vibrating or shaking the building material and affecting the magnetism of the building material.

28. The method of claim 27, wherein the building material includes blocks.

29. The method of claim 23, wherein receiving at least one measurement comprises receiving at least one measurement indicative of at least one of heart rate, blood pressure, electroencephalogram (EEG) information, pupil dilation, temperature, galvanic skin response, perspiration and breathing.

30. The method of claim 23, wherein determining whether the operator is in an elevated emotional state includes determining whether the at least one measurement meets a predetermined criteria indicative of the operator's emotional state, and wherein affecting the at least one behavior of the toy is performed when the at least one measurement is determined to meet the predetermined criteria.

31. The method of claim 30, wherein the predetermined criteria includes a threshold and wherein affecting at least one behavior comprises affecting at least one behavior when the at least one measurement exceeds the threshold.

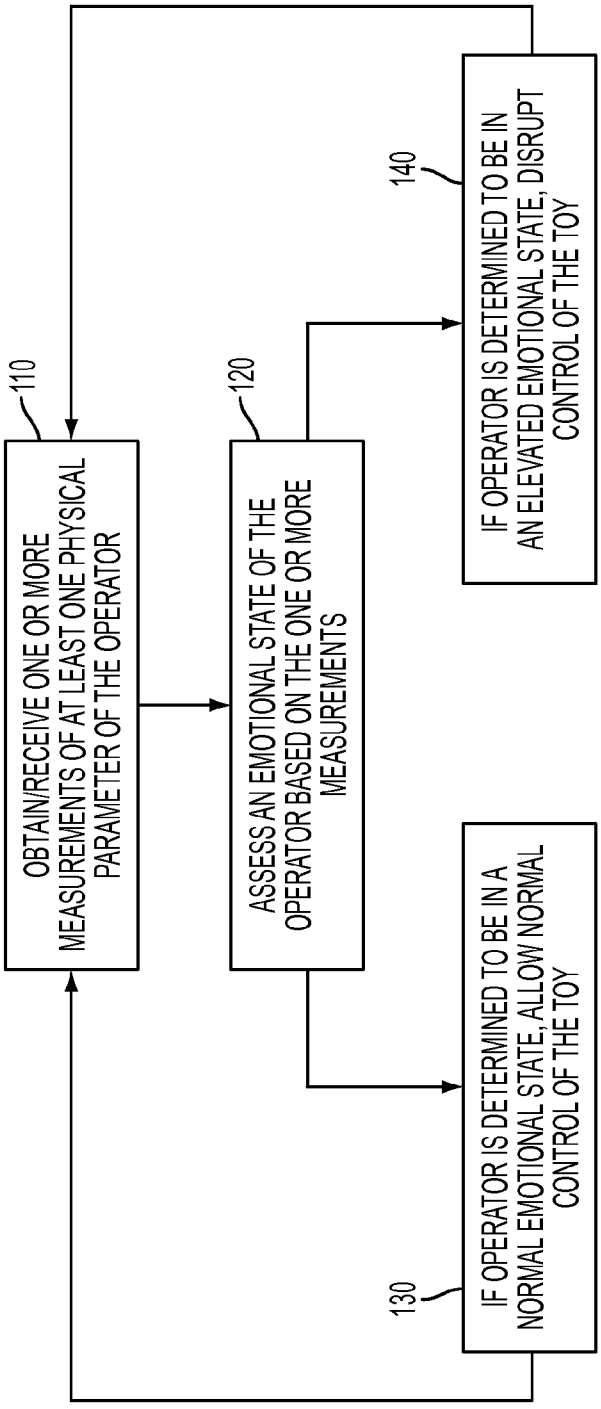
110
OBTAIN/RECEIVE ONE OR MORE MEASUREMENTS OF AT LEAST ONE PHYSICAL PARAMETER OF THE OPERATOR
120
ASSESS AN EMOTIONAL STATE OF THE OPERATOR BASED ON THE ONE OR MORE MEASUREMENTS
130
IF OPERATOR IS DETERMINED TO BE IN A NORMAL EMOTIONAL STATE, ALLOW NORMAL CONTROL OF THE TOY
140
IF OPERATOR IS DETERMINED TO BE IN AN ELEVATED EMOTIONAL STATE, DISRUPT CONTROL OF THE TOY

FIG. 1

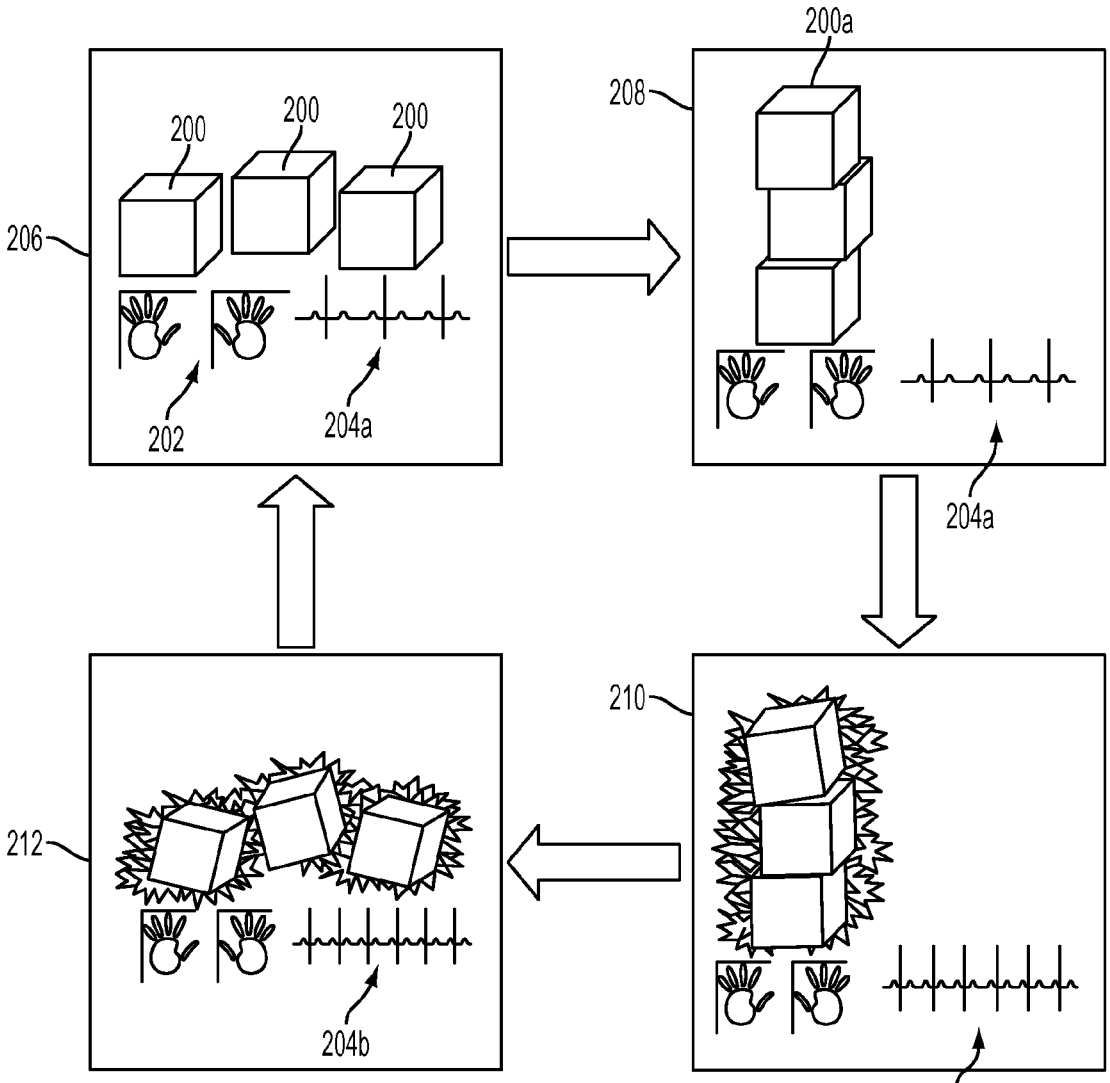

FIG. 2

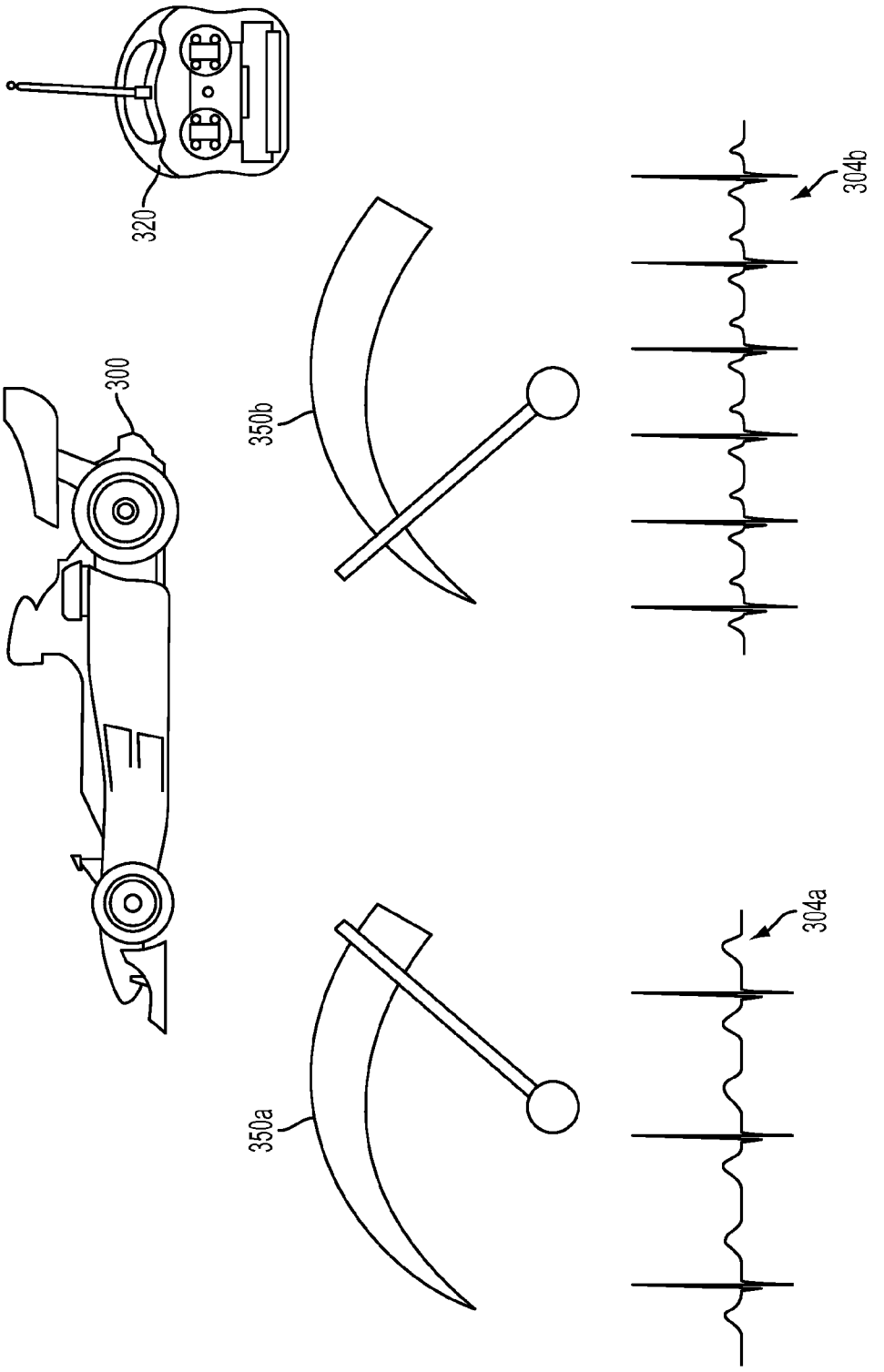

FIG. 3

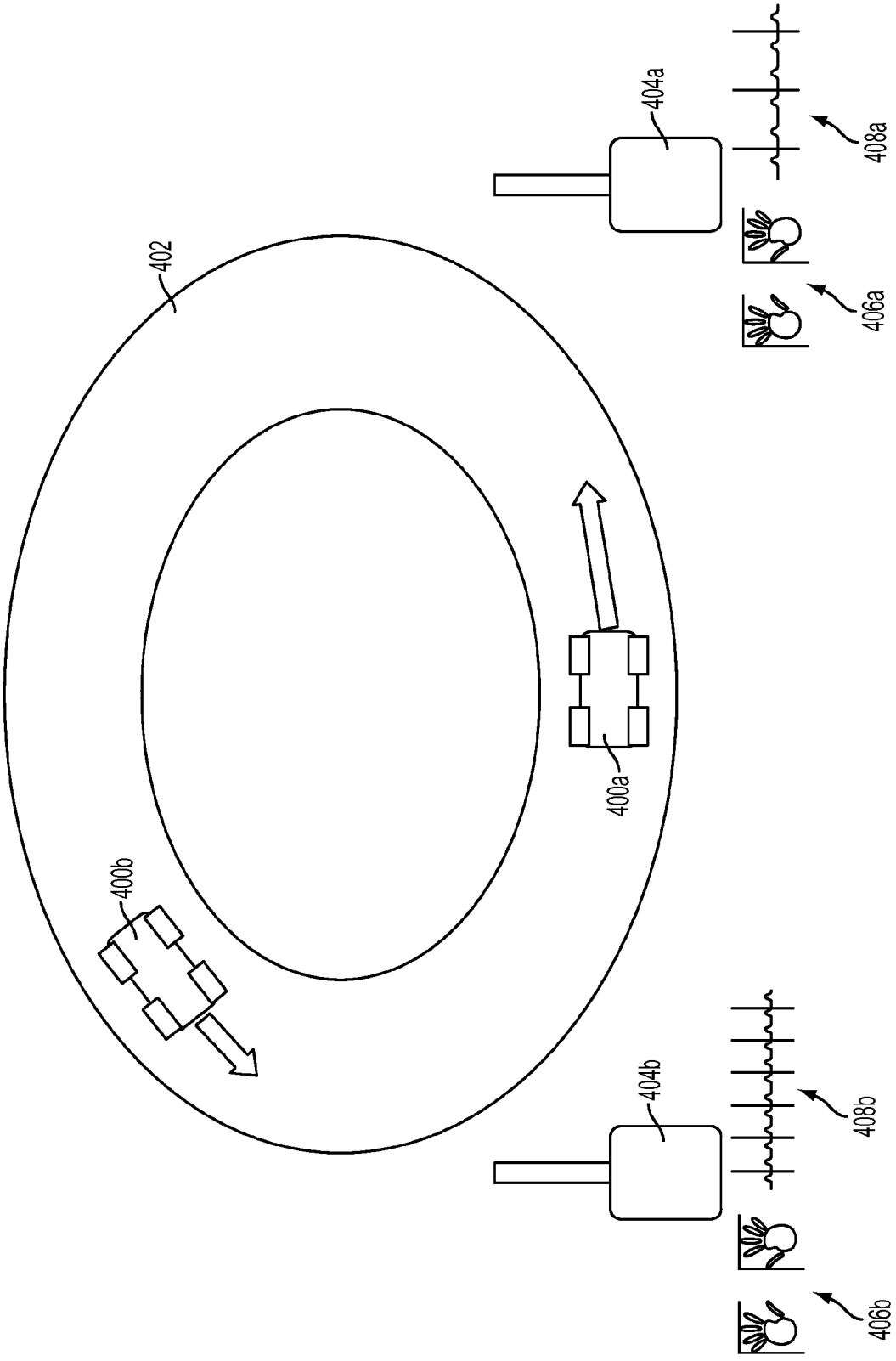

FIG. 4

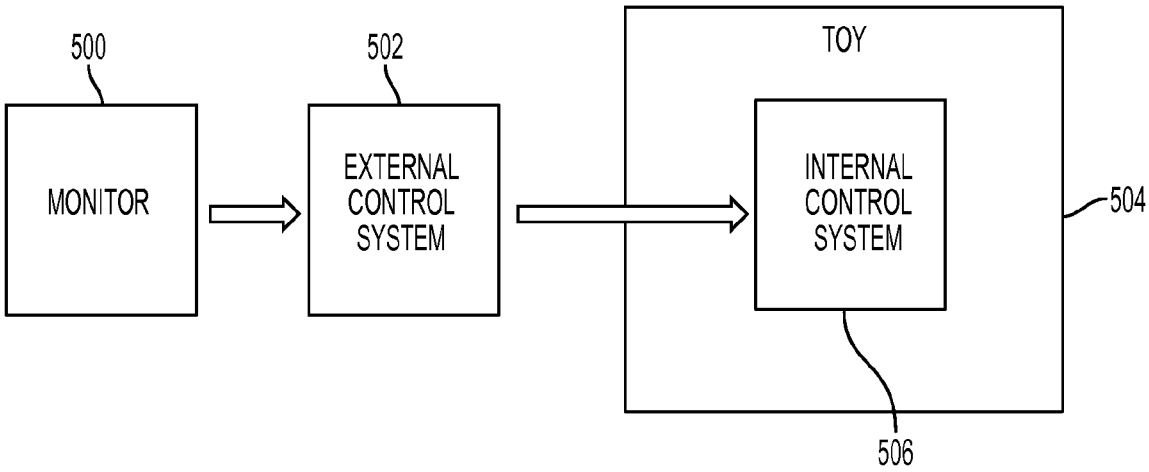
500
502
TOY
MONITOR
EXTERNAL CONTROL SYSTEM
INTERNAL CONTROL SYSTEM
504
506

FIG. 5A

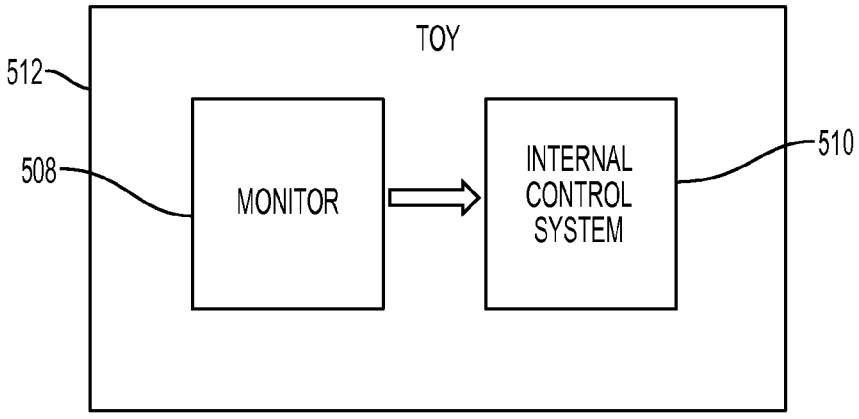
TOY
512
508
MONITOR
INTERNAL CONTROL SYSTEM
510

FIG. 5B

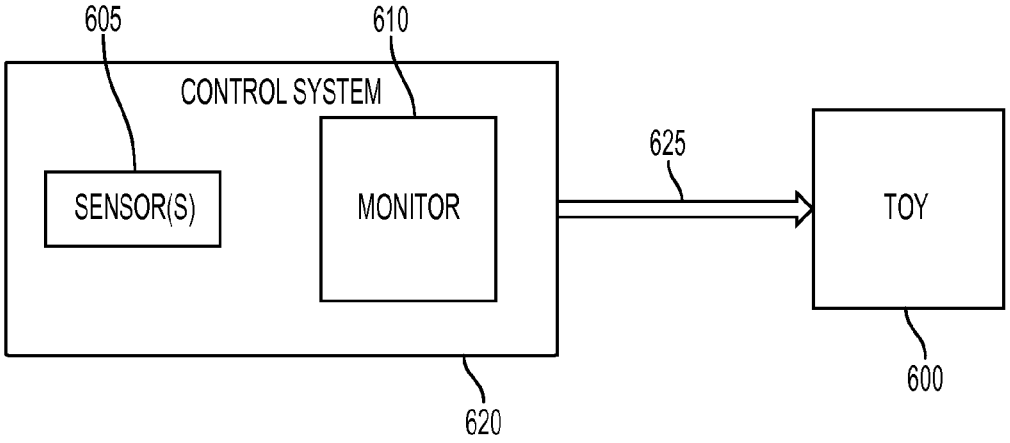
605
610
CONTROL SYSTEM
SENSOR(S)
MONITOR
625
TOY
600
620

FIG. 6A

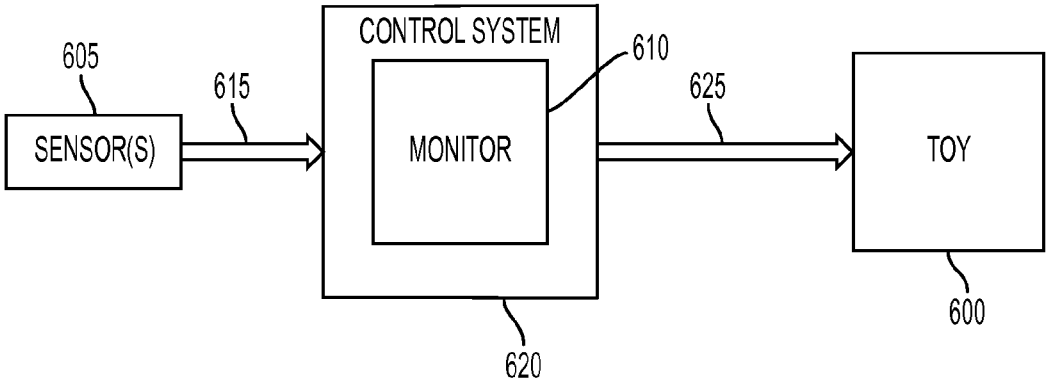
CONTROL SYSTEM
605
615
610
625
SENSOR(S)
MONITOR
TOY
600
620

FIG. 6B

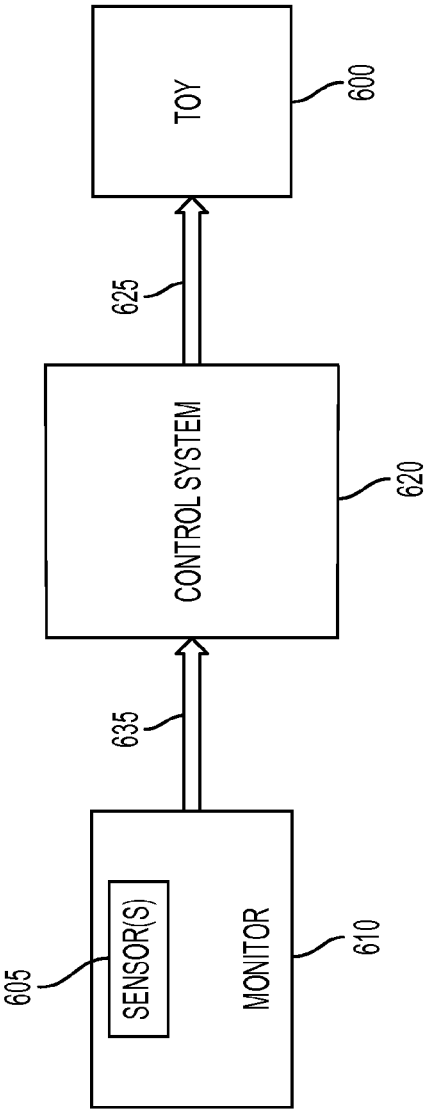
TOY
600
625
CONTROL SYSTEM
620
635
SENSOR(S)
MONITOR
605
610

FIG. 6C

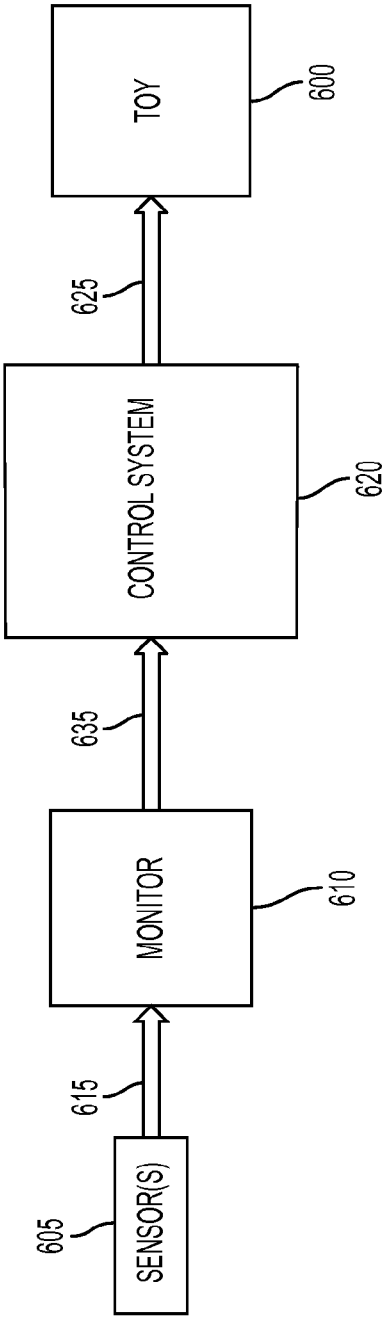
TOY
600
625
CONTROL SYSTEM
620
635
MONITOR
610
615
SENSOR(S)
605

FIG. 6D

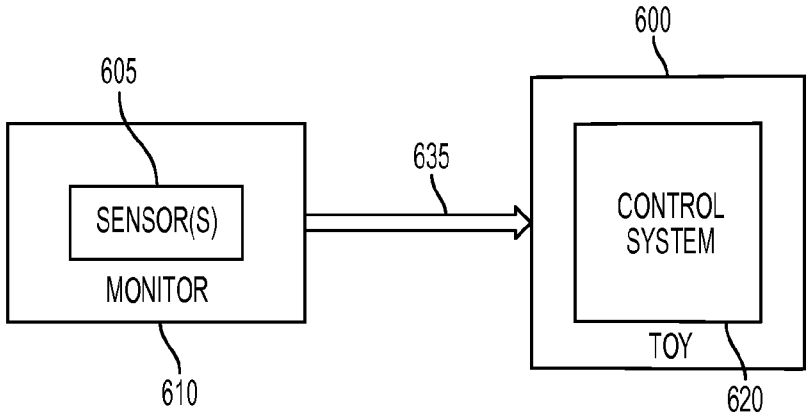
600
605
635
SENSOR(S)
MONITOR
CONTROL SYSTEM
TOY
610
620

FIG. 6E

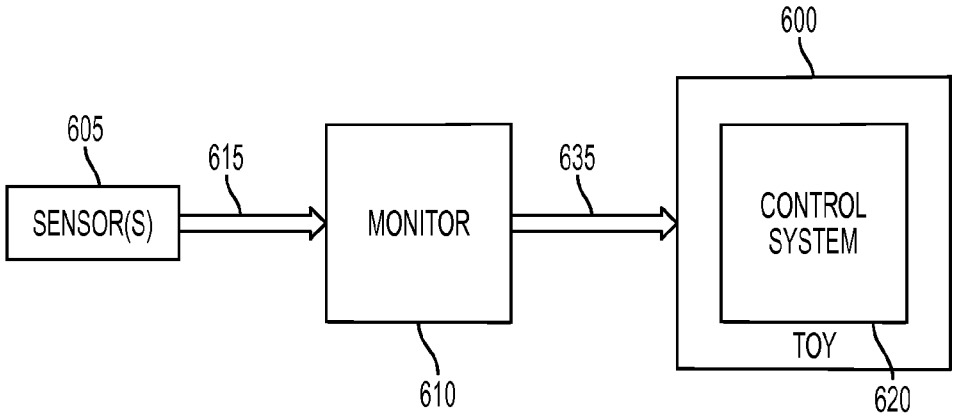
600
605
615
635
SENSOR(S)
MONITOR
CONTROL SYSTEM
TOY
610
620

FIG. 6F

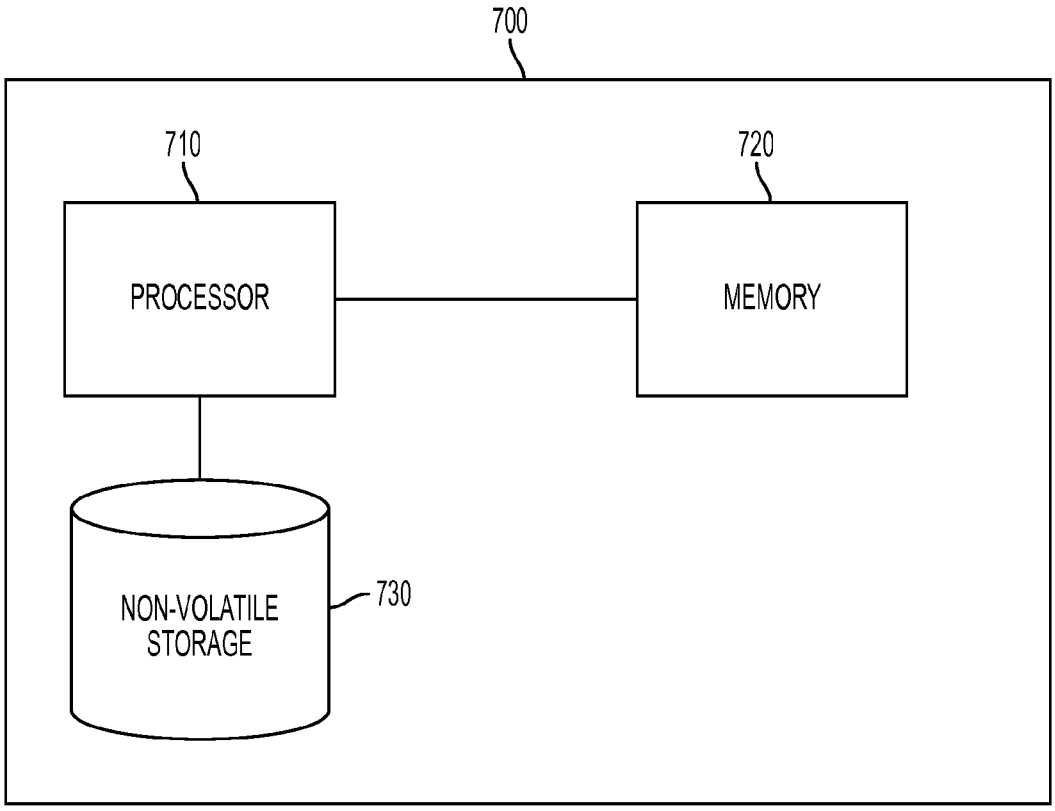

FIG. 7

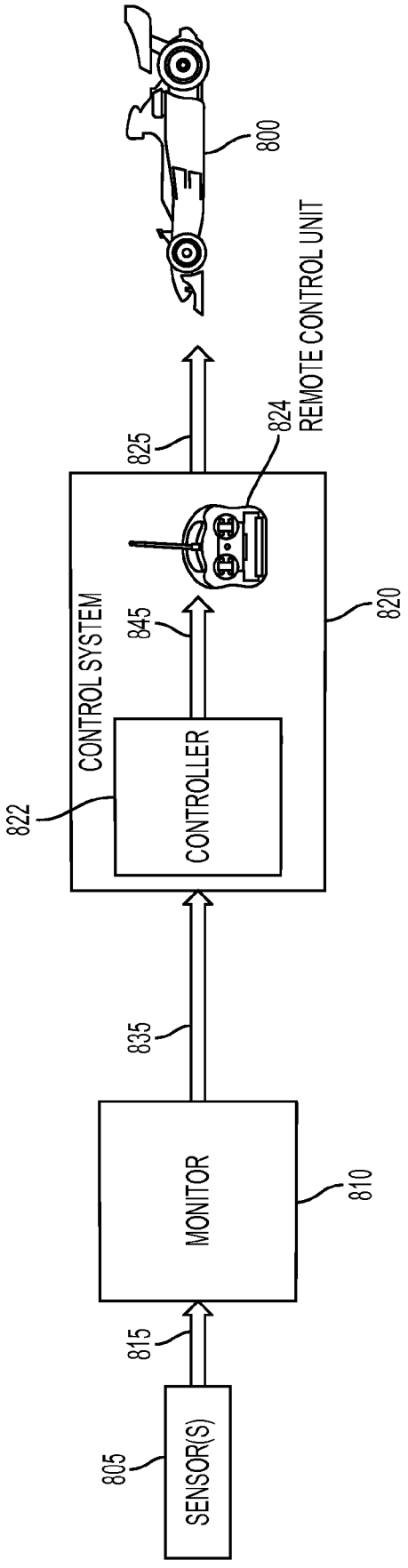
800
REMOTE CONTROL UNIT
824
825
820
CONTROL SYSTEM
845
CONTROLLER
822
835
MONITOR
810
815
SENSOR(S)
805

FIG. 8

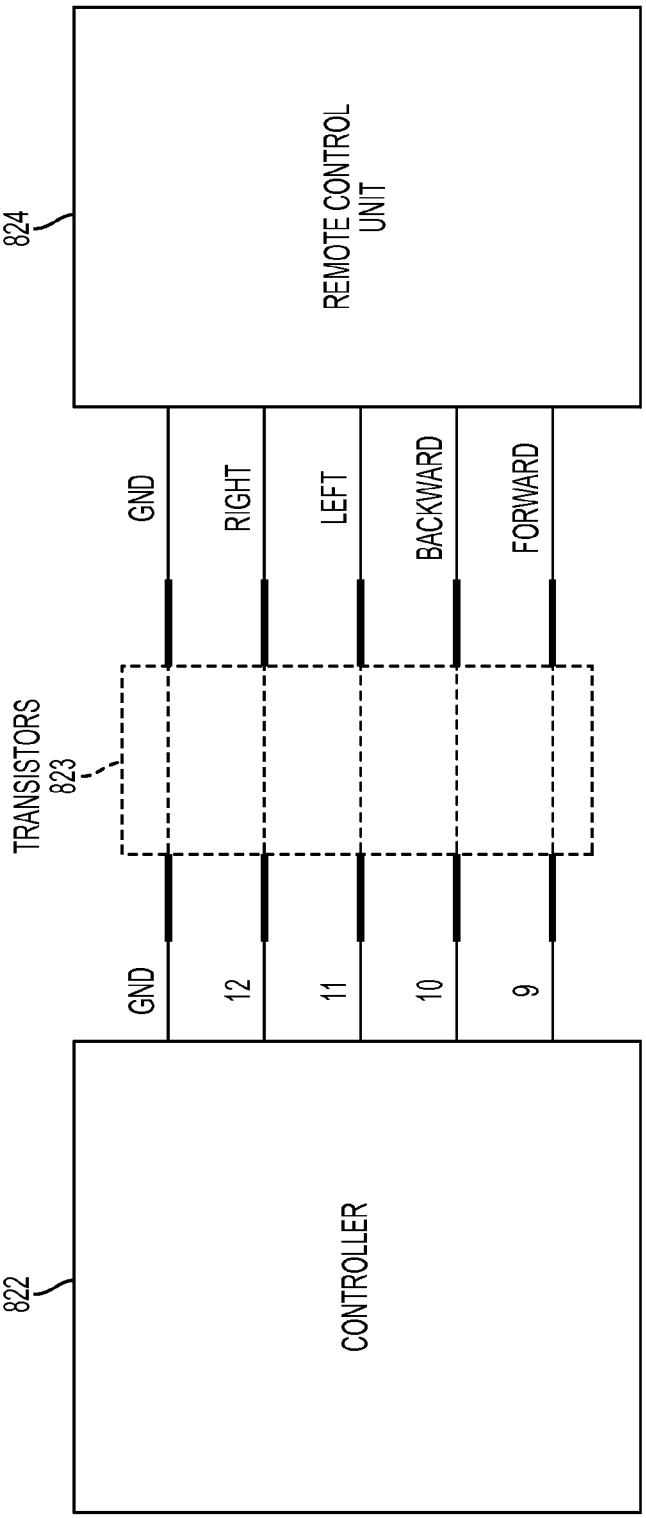
824
REMOTE CONTROL UNIT
GND
RIGHT
LEFT
BACKWARD
FORWARD
TRANSISTORS
823
GND
12
11
10
9
822
CONTROLLER

FIG. 9

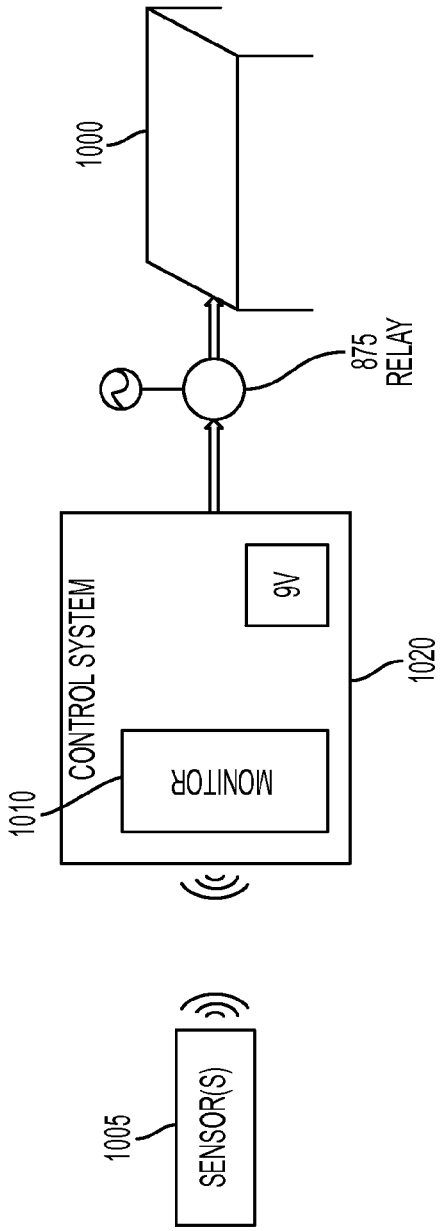
1000
875
RELAY
9V
CONTROL SYSTEM
MONITOR
1010
1020
1005
SENSOR(S)

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/058719

A. CLASSIFICATION OF SUBJECT MATTER

A63H 17/385(2006.01)i, A63H 17/39(2006.01)i, A63H 30/04(2006.01)i

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)

A63H 17/385; A63F 9/00; A63F 9/22; A63H 30/00; A61B 5/0408; A63F 13/00

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

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: emotional control, physical parameter, heart rate, toy, remote controlled vehicle, monitor, sensor, controller and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 09-308770 A (IKYO KK.) 02 December 1997 See abstract and paragraphs [0006]-[0009],[0013],[0018],[0024],[0027],[0058]	1,11,14,20,23,29 2-10,12-13,15-19 ,21-22,24-28,30-31
A	JP 08-191955 A (AMTEX KK.) 30 July 1996 See abstract and paragraphs [0001],[0003],[0009],[0012],[0015],[0016],[0061]	1-31
A	US 2002-0142701 A1 (ROSENBERG, LOUIS B.) 03 October 2002 See abstract, paragraphs [0017],[0018],[0052] and figures 1,2	1-31
A	JP 2006-025869 A (KONAMI CO., LTD.) 02 February 2006 See abstarct and claims 1-8	1-31

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 MARCH 2013 (19.03.2013)	**20 MARCH 2013 (20.03.2013)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Sun

Telephone No. 82-42-481-3578

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2012/058719

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 09-308770 A	02.12.1997	None	
JP 08-191955 A	30.07.1996	JP 02-820911 B2	28.08.1998
		US 05772508A A	30.06.1998
US 2002-0142701 A1	03.10.2002	AT 437684 T	15.08.2009
		CN 101711923 A	26.05.2010
		CN 1527735 A	08.09.2004
		DE 60233123 D1	10.09.2009
		EP 1381436 A1	21.01.2004
		JP 04-441179 B2	15.01.2010
		JP 2004-532066 A	21.10.2004
		JP 2010-029724 A	12.02.2010
		KR 10-0851711 B1	11.08.2008
		WO 02-078810 A1	10.10.2002
JP 2006-025869 A	02.02.2006	CN 1980715 A	13.06.2007
		EP 1769830 A1	04.04.2007
		JP 03-751626 B2	01.03.2006
		JP 03-751627 B2	01.03.2006
		JP 2006-025871 A	02.02.2006
		KR 10-0863866 B1	15.10.2008
		KR 10-0996574 B1	24.11.2010
		TW 276452 A	21.03.2007
		US 2008-0032796 A1	07.02.2008
		US 8075400 B2	13.12.2011
		WO 2006-006362 A1	19.01.2006

专利名称(译)	情绪控制方法和装置		
公开(公告)号	EP2763763A1	公开(公告)日	2014-08-13
申请号	EP2012838000	申请日	2012-10-04
[标]申请(专利权)人(译)	儿童医学中心公司		
申请(专利权)人(译)	儿童医学中心CORPORATION		
当前申请(专利权)人(译)	儿童医学中心CORPORATION		
[标]发明人	GONZALEZ HEYDRICH JOSEPH KAHN JASON DUCHARME PETER ROTENBERG ALEXANDER		
发明人	GONZALEZ-HEYDRICH, JOSEPH KAHN, JASON DUCHARME, PETER ROTENBERG, ALEXANDER		
IPC分类号	A63H17/385 A63H17/39 A63H30/04 A61B5/00 A61B5/16 A63H17/00 A63H30/00 A63H33/04		
CPC分类号	A63H29/22 A61B5/0024 A61B5/02055 A61B5/021 A61B5/02405 A61B5/02438 A61B5/0476 A61B5/0533 A61B5/165 A61B5/6896 A63F2250/26 A63F2250/265 A63F2300/1012 A63H17/00 A63H30/00 A63H30/02 A63H30/04 A63H33/04 A63H2200/00 G09B19/00		
优先权	61/543033 2011-10-04 US		
其他公开文献	EP2763763A4		
外部链接	Espacenet		

摘要(译)

公开了一种包括至少一个监视器和玩具的系统。至少一个监视器可以通信地耦合到至少一个传感器，该传感器被配置为测量操作员的至少一个物理参数。所述至少一个监测器从所述至少一个传感器接收指示所述操作者的至少一个物理参数的至少一个测量值。至少一个监视器可以至少部分地基于至少一个测量来确定操作者是否处于升高的情绪状态。玩具可以由至少一个操作员操作，并且可以包括与至少一个监视器通信的控制系统。控制系统可以被配置为当监视器指示操作者处于升高的情绪状态时影响玩具的至少一个行为以使玩具更难以使用。