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Chair with shape memory material-based movement synchronized with visual content

Abstract

A chair can be configured for synchronized movement with visual content, such as a video game or movie, presented on a display. The chair can include a seat portion. A plurality of actuators can be operatively positioned to cause a movement of the seat portion. The actuators can include one or more shape memory material members. Each of the actuators being configured such that, when an activation input is provided to the one or more shape memory material members, the one or more shape memory material members change from a first configuration to a second configuration and cause the actuator to morph into an activated configuration. One or more processors operatively connected to selectively activate one or more of the actuators by causing the activation input to be provided to the one or more shape memory material members of at least one of the actuators.

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Background/Summary

FIELD

(1) The subject matter herein relates in general to chairs and, more particularly, to chairs with adjustable portions.

BACKGROUND

(2) A chair is a common piece of furniture. It has a seat and a back attached to the seat. Chairs can be used for various purposes and can have various designs. Chairs can be configured to provide support and comfort to a person. Some chairs can include ergonomic features to enhance user comfort. Some chairs are powered and allow a user to adjust one or more aspects of the seat.

SUMMARY

(3) In one respect, the present disclosure is directed to a chair. The chair includes a seat portion and a plurality of actuators. The actuators are located below the seat portion. Each of the actuators can include one or more shape memory material members. Each of the actuators can be configured such that, when an activation input is provided to the one or more shape memory material members, the one or more shape memory material members change from a first configuration to a second configuration and cause the actuator to morph into an activated configuration a height of the actuator increases. The actuators can be operatively positioned to cause a movement of the seat portion.

(4) In another respect, the present disclosure is directed to a system. The system includes a chair with a seat portion. The system includes a plurality of actuators. The actuators can be located below the seat portion. Each of the actuators can include one or more shape memory material members. Each of the actuators can be configured such that, when an activation input is provided to the one or more shape memory material members, the one or more shape memory material members change from a first configuration to a second configuration and cause the actuator to morph into an activated configuration. The actuators can be selectively actuatable. The actuators can be operatively positioned to cause a movement of the seat portion. The system can include one or more processors. The one or more processors can be operatively connected to selectively activate one or more of the

plurality of actuators by causing the activation input to be provided to the one or more shape memory material members of at least one of the plurality of actuators.
(5) In still another respect, the present disclosure is directed to a method of moving a portion of a chair synchronized with visual content. The chair can include a seat portion and a plurality of actuators located below the seat portion. Each of the actuators can include one or more shape memory material members. Each of the actuators can be configured such that, when an activation input is provided to the one or more shape memory material members, the one or more shape memory material members change from a first configuration to a second configuration and cause the actuator to morph into an activated configuration. The actuators can be selectively actuatable and operatively positioned to cause a movement of the seat portion. One or more processors can be operatively connected to selectively activate one or more of the actuators by causing the activation input to be provided to the one or more shape memory material members of at least one of the actuators. The method can include analyzing visual content to determine a corresponding chair movement. The corresponding chair movement can be synchronized with at least a portion of the visual content. The method can include selecting one or more of the actuators to achieve the corresponding chair movement. The method can include causing an activation input to be provided to the selected one or more of the actuators. Thus, the selected one or more actuators can be activated to cause the seat to move according to the corresponding chair movement.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is an example of a chair.
(2) FIG. **2** is a view of the chair with a cut-away portion, showing a plurality of actuators.
(3) FIG. **3** is an example of a first arrangement of the plurality of actuators.
(4) FIG. **4** is an example of a second arrangement of the plurality of actuators.
(5) FIG. **5** is an example of a third arrangement of the plurality of actuators.
(6) FIG. **6** is a view of a portion of the chair, showing a platform on top of the plurality of actuators.
(7) FIG. **7** is an example of an actuator in a non-activated condition.
(8) FIG. **8** is an example of the actuator in an activated condition.
(9) FIG. **9** is a view of the chair, showing a tilting of the chair due to the actuator of a subset of the plurality of actuators.
(10) FIG. **10** is an example of a method.
(11) FIG. **11** is an example of a system.
DETAILED DESCRIPTION
(12) Arrangements described here are directed to the use of shape memory material-based actuators in connection with a chair used for viewing visual content, such as a gaming chair, a movie chair, a theater chair, or any other similar seat structure, now known or later developed. The chair can be configured for synchronized movement with visual content presented to an occupant of the chair. The chair can include a plurality of actuators operatively positioned with respect to the seat portion of the chair. The actuators can include one or more shape memory material members. Selected actuators can be activated to cause the seat portion to move in a synchronized manner with the visual content.
(13) Detailed embodiments are disclosed herein; however, it is to be understood that the disclosed embodiments are intended only as examples. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the aspects herein in virtually any appropriately detailed structure. Further, the terms and phrases used herein are not intended to be limiting but rather to provide an understandable description of possible implementations. Various embodiments are shown in FIGS. **1-11**, but the embodiments are not

limited to the illustrated structure or application.

(14) It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details.

(15) Referring to FIG. **1**, an example of a chair **100** is shown. The chair **100** can be any type of seat, now known or later developed. The chair **100** can have any suitable configuration. For instance, the chair **100** can include a back portion **102** and a seat portion **104**. In some arrangements, the chair **100** can include a headrest **106** and/or arm rests **108**. In some arrangements, the chair **100** can be an office chair, a gaming chair, a movie theater chair, a recliner, or any other type of seat or chair, now known or later developed.

(16) The chair **100** can include a base portion **110** located below the seat portion **104**. The seat portion **104** can include a cushion. The base portion **110** can include an upper platform **112** and a lower platform **114**. In a non-activated condition, the upper platform **112** and the lower platform **114** can be substantially parallel to each other.

(17) In some arrangements, the base portion **110** can include one or more side walls **116**. The side wall(s) **116** can be operatively connected to the lower platform **114**. In some arrangements, the side wall(s) **116** can be a rigid structure. In such case, the side wall(s) **116** may not be attached to the upper platform **112**. When one or more of the actuators **200** are activated, a portion of the upper platform **112** may separate from the side wall(s) **116**. In some arrangements, the side wall(s) **116** can be configured to expand and contract, such as in an accordion-like configuration. In such case, the side wall(s) **116** can be operatively connected to the upper platform **112**. Thus, when one or more of the actuators **200** are activated, the upper platform **112** can remain connected to the side wall(s) **116**.

(18) FIG. **2** is a view of the chair **100** with a cut-away of the base portion **110**. A plurality of actuators **200** can be located within the base portion **110**. The plurality of actuators **200** can be operatively positioned between the upper platform **112** and the lower platform **114**. When not activated, the upper platform **112** and the lower platform **114** can be substantially parallel to each other. It will be understood that the terms “upper” and “lower” are used for convenience to note the relative position of structures when used in its intended operational position and that these terms are not intended to be limiting. The actuators **200** can be operatively connected to one or both of the upper platform **112** and the lower platform **114**.

(19) The lower platform **114** can be substantially fixed. As a result, the activation and deactivation of the actuators **200** does not essentially affect the orientation or position of the lower platform **114**.

(20) On the other hand, the upper platform **112** can be configured to be movable in response to activation or deactivation of the actuators **200**. As a result, the actuators **200** can cause a movement of the seat portion **104** or the rest of the chair **100** located above the upper platform **112**. The seat portion **104** can be supported on the upper platform **112**.

(21) The plurality of actuators **200** can be arranged in any of a number of ways. Some example arrangements are shown in FIGS. **3-5**. Referring to FIG. **3**, an example of a first arrangement **300** of the plurality of actuators **200** is shown. In this example, the actuators **200** can be arranged in a substantially rectangular pattern. Each actuator **200** can be oriented at substantially 90 degrees relative to its neighboring actuator **200**.

(22) Referring to FIG. **4**, an example of a second arrangement **400** of the plurality of actuators **200** is shown. In this example, the plurality of actuators **200** can be arranged in an offsetting substantially parallel pattern. As is shown, there can be two groups of actuators **200**. In each group, the actuators **200** can be offset from each other. Also, the actuators **200** can be substantially parallel to each other.

(23) FIG. **5** is an example of a third arrangement **500** of the plurality of actuators **200**. In this example, the actuators **200** can be arranged in a radial pattern about a central point or area. The

actuators **200** can be substantially equally spaced, or one or more of the actuators **200** can be non-equally spaced from the other actuators **200**.

(24) While the above examples show various arrangements in which there are four actuators, it will be appreciated that arrangements described herein are not limited to there being four actuators. Indeed, there can be more than four actuators, or there can be fewer than four actuators.

(25) FIGS. **7-8** show an example of an actuator **200**. FIG. **7** shows an example of the actuator **200** in a non-activated condition, and FIG. **8** shows an example of the actuator **200** in an activated condition.

(26) The actuator **200** can include a first endcap **210** and a second endcap **220**. The first endcap **210** and the second endcap **220** can be spaced apart. The first endcap **210** and the second endcap **220** can face toward each other.

(27) The first endcap **210** and the second endcap **220** can have any suitable size, shape, and/or configuration. In one or more arrangements, the first endcap **210** and the second endcap **220** can be substantially mirror images of each other. In one or more arrangements, the first endcap **210** can have three prongs, including an upper prong **212**, a middle prong **214**, and a lower prong **216**. Similarly, the second endcap **220** can have three prongs, including an upper prong **222**, a middle prong **224**, and a lower prong **226**.

(28) The first endcap **210** and the second endcap **220** can be made of any suitable material. The first endcap **210** and the second endcap **220** can be substantially rigid structures. In some arrangements, the upper prongs **212**, **222** and the lower prongs **216**, **226** of the first and second endcaps **210**, **220** can be flexible to accommodate changes to the actuator **200** when activated and deactivated. The first and second endcaps **210**, **220** can be oriented such that the middle prong **214** of the first endcap **210** is substantially aligned with the middle prong **224** of the second endcap **220**.

(29) The actuator **200** can include a first outer member **240**. The first outer member **240** can have a bowed shape. The first outer member **240** can have a convex side **242** and a concave side **244**. In some arrangements, the first outer member **240** can be made of a single piece of material. In other arrangements, the first outer member **240** can be made of a plurality of pieces of material. In some arrangements, the first outer member **240** can be made of a plurality of layers. The first endcap **210** and the second endcap **220** can be made of any suitable material. In some arrangements, the first outer member **240** can be made of a flexible to accommodate changes to the actuator **200** when activated and deactivated.

(30) The first outer member **240** can include one or more protrusions **246**. The protrusion(s) **246** can be used to properly locate another structure on the plurality of actuators **200**. In some arrangements, the protrusion(s) **246** can be substantially centrally located on the convex side **242** of the first outer member **240**. In some arrangements, the protrusion(s) **246** can be formed separately and operatively connected to the convex side **242** of the first outer member **240**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. In other arrangements, the protrusion(s) **246** and the first outer member **240** can be formed together as a unitary structure.

(31) The first outer member **240** can be operatively connected to the first endcap **210** and the second endcap **220**. For instance, the first outer member **240** can be operatively connected to the upper prong **212** of the first endcap **210** and to the upper prong **222** of the second endcap **220**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. In some arrangements, one or more portions of the first outer member **240**, such as the ends, can be operatively connected to the middle prong **214** of the first endcap **210** and the middle prong **224** of the second endcap **220**.

(32) The actuator **200** can include a second outer member **250**. The second outer member **250** can have a bowed shape. The second outer member **250** can have a convex side **252** and a concave side

254. In some arrangements, the second outer member **250** can be made of a single piece of material. In other arrangements, the second outer member **250** can be made of a plurality of pieces of material. In some arrangements, the second outer member **250** can be made of a plurality of layers. The first endcap **210** and the second endcap **220** can be made of any suitable material. In some arrangements, the second outer member **250** can be made of a flexible to accommodate changes to the actuator **200** when activated and deactivated.

(33) The actuator **200** can include a base **260**. The base **260** can provide stability to the actuator **200**. In some arrangements, the base **260** can be operatively connected to the convex side **252** of the second outer member **250**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. In other arrangements, the base **260** and the second outer member **250** can be formed together as a unitary structure. The base **260** can have any suitable size, shape, and/or configuration. The base **260** can be a substantially flat structure. In one or more arrangements, the base **260** can be substantially rectangular. The base **260** can be made of any suitable material. The base **260** can be made of the same material as the second outer member **250**, or the base **260** can be made of a different material.

(34) The actuator **200** can include one or more ribs **256**. The rib(s) **256** can prevent the first outer member **240** from bottoming out. In some arrangements, the rib(s) **256** can be operatively connected to the concave side **254** of the second outer member **250**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. In other arrangements, the rib(s) **256** and the second outer member **250** can be formed together as a unitary structure. The rib(s) **256** can have any suitable size, shape, and/or configuration. In one or more arrangements, the rib(s) **256** can be substantially rectangular. The rib(s) **256** can be made of any suitable material. The rib(s) **256** can be made of the same material as the second outer member **250**, or the rib(s) **256** can be made of a different material.

(35) The second outer member **250** can be operatively connected to the first endcap **210** and the second endcap **220**. For instance, the second outer member **250** can be operatively connected to the lower prong **216** of the first endcap **210** and to the lower prong **226** of the second endcap **220**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. In some arrangements, one or more portions of the second outer member **250**, such as the ends, can be operatively connected to the middle prong **214** of the first endcap **210** and the middle prong **224** of the second endcap **220**.

(36) The first outer member **240** and the second outer member **250** can be composed of or include a substantially flexible material. The first outer member **240** and the second outer member **250** can be reversibly deformed, such that the first outer member **240** and the second outer member **250** will not be damaged during the deformation. Damage can include cracking, breaking, fracturing, or other forms of inelastic deformation. In some implementations, the flexible material is a flexible polymer. Specific examples of flexible polymers which can be used various implementations include rubber (including natural rubber, styrene-butadiene, polybutadiene, neoprene, ethylene-propylene, butyl, nitrile, silicone), polycarbonates, acrylic, polyesters, polyethylenes, polypropylenes, nylon, polyvinyl chlorides, polystyrenes, elastomers, polyolefins, and others flexible polymers known to persons skilled in the art. In some implementations, the flexible material can be exposed to a degree of stretch selected in the range of about 1% to about 1300%, such as about 10% to about 1300%, or about 100% to about 1300% without resulting in mechanical failure (e.g., tearing, cracking, or inelastic deformation). In further implementations, the flexible material can be deformed to a radius of curvature selected in the range of 100 micrometers (μm) to 3 meters (m) without mechanical failure.

(37) The first outer member **240** and the second outer member **250** can be oriented such that their

concave sides **244**, **254** face each other. The first outer member **240** and the second outer member **250** can define a cavity **270**.

(38) The actuator **200** can include one or more shape memory material members **280**. The shape memory material members **280** can be operatively connected to the first endcap **210** and the second endcap **220**. More particularly, the shape memory material member **280** can be operatively connected to the middle prong **214** of the first endcap **210** and the middle prong **224** of the second endcap **220**. Any suitable manner of operative connection can be provided, such as one or more fasteners, one or more adhesives, one or more welds, one or more brazes, one or more forms of mechanical engagement, or any combination thereof. The shape memory material member(s) **280** can be located within the cavity **270**.

(39) In some arrangements, there can be a single shape memory material member **280**. In such case, the shape memory material member **280** can, for example, extend straight across the cavity from the first endcap **210** and the second endcap **220**. In another example, the shape memory material member **280** can extend in a zig zag or serpentine pattern between the first endcap **210** and the second endcap **220**.

(40) In some arrangements, there can be a plurality of shape memory material members **280**. In such case, the shape memory material members **280** can be distributed, arranged, and/or oriented in any suitable manner. For instance, the shape memory material members **280** can extend substantially parallel to each other. In other arrangements, one or more of the shape memory material members **280** can extend non-parallel to the other shape memory material members **280**. In some instances, some of the plurality of shape memory material members **280** may cross over each other.

(41) The phrase "shape memory material" includes materials that changes shape when an activation input is provided to the shape memory material and, when the activation input is discontinued, the material substantially returns to its original shape. Examples of shape memory materials include shape memory alloys (SMA) and shape memory polymers (SMP).

(42) In one or more arrangements, the shape memory material members **280** can be shape memory material wires. As an example, the shape memory material members **280** can be shape memory alloy wires. Thus, when an activation input (i.e., heat) is provided to the shape memory alloy wire(s), the wire(s) can contract. Shape memory alloy wire(s) can be heated in any suitable manner, now known or later developed. For instance, shape memory alloy wire(s) can be heated by the Joule effect by passing electrical current through the wires. In some instances, arrangements can provide for cooling of the shape memory alloy wire(s), if desired, to facilitate the return of the wire(s) to a non-activated configuration.

(43) The wire(s) can have any suitable characteristics. For instance, the wire(s) can be high temperature wires with austenite finish temperatures from about 80 degrees Celsius to about 110 degrees Celsius. The wire(s) can have any suitable diameter. For instance, the wire(s) can be from about 0.2 millimeters (mm) to about 0.7 mm, from about 0.3 mm to about 0.5 mm, or from about 0.375 millimeters to about 0.5 millimeters in diameter. In some arrangements, the wire(s) can have a stiffness of up to about 70 gigapascals. The pulling force of SMA wire(s) can be from about 250 MPA to about 400 MPa. The wire(s) can be configured to provide an initial moment from about 300 to about 600 N.Math.mm, or greater than about 500 N.Math.mm, where the unit of newton millimeter (N.Math.mm) is a unit of torque (also called moment) in the SI system. One newton meter is equal to the torque resulting from a force of one newton applied perpendicularly to the end of a moment arm that is one meter long. In various aspects, the wire(s) can be configured to transform in phase, causing the shape memory material members **280** to be moved from non-activated position to an activated position in about 3 seconds or less, about 2 seconds or less, about 1 second or less, or about 0.5 second or less.

(44) The wire(s) can be made of any suitable shape memory material, now known or later developed. Different materials can be used to achieve various balances, characteristics, properties, and/or qualities. As an example, an SMA wire can include nickel-titanium (Ni—Ti, or nitinol). One

example of a nickel-titanium shape memory alloy is FLEXINOL, which is available from Dynaolloy, Inc., Irvine, California. As a further example, the SMA wires can be made of Cu—Al—Ni, Fe—Mn—Si, or Cu—Zn—Al.
(45) The SMA wire can be configured to increase or decrease in length upon changing phase, for example, by being heated to a phase transition temperature T.sub.SMA. Utilization of the intrinsic property of SMA wires can be accomplished by using heat, for example, via the passing of an electric current through the SMA wire in order provide heat generated by electrical resistance, in order to change a phase or crystal structure transformation (i.e., twinned martensite, detwinned martensite, and austentite) resulting in a lengthening or shortening the SMA wire. In some implementations, during the phase change, the SMA wire can experience a decrease in length of from about 2 to about 8 percent, or from about 3 percent to about 6 percent, and in certain aspects, about 3.5 percent, when heated from a temperature less than the T.sub.SMA to a temperature greater than the T.sub.SMA.
(46) Other active materials may be used in connection with the arrangements described herein. For example, other shape memory materials may be employed. Shape memory materials, a class of active materials, also sometimes referred to as smart materials, include materials or compositions that have the ability to remember their original shape, which can subsequently be recalled by applying an external stimulus, such as an activation signal.
(47) While the shape memory material members **280** are described, in some implementations, as being wires, it will be understood that the shape memory material members **280** are not limited to being wires. Indeed, it is envisioned that suitable shape memory materials may be employed in a variety of other forms, such as sheets, plates, panels, strips, cables, tubes, or combinations thereof. In some arrangements, the shape memory material members **280** may include an insulating coating.
(48) The actuator **200** can include a first dimension **290** and the second dimension **295**. The first dimension **290** can describe a width of the actuator **200**, and the second dimension **295** can describe a height of the actuator **200**. The first dimension **290** and the second dimension **295** can be substantially perpendicular to each other.
(49) As noted above, FIG. **8** is an example of the actuator **200** in an activated condition. When an activation input (e.g., electrical energy) is provided to the shape memory material member(s) **280**, the shape memory material member(s) **280** can contract. This contraction causes the shape memory material member(s) **280** to pull the first endcap **210** and the second endcap **220** toward each other in a direction that corresponds to the first dimension **290**.
(50) Consequently, the ends of the first outer member **240** can be drawn toward each other in a direction that corresponds to the first dimension **290**, and the ends of the second outer member **250** can be drawn toward each other in a direction that corresponds to the first dimension **290**. As a result, the first outer member **240** and the second outer member **250** can bow outward and away from each other in a direction that corresponds to the second dimension **295**. It will be appreciated that the first dimension **290** (i.e., the width) of the actuator **200** can decrease, and the second dimension **295** (i.e., the height) of the actuator **200** can increase.
(51) It will be appreciated that the actuator **200** shown in FIGS. **7-8** is merely one example of an actuator that can be used in connection with arrangements described herein. Other actuator configurations are possible. Additional non-limiting examples of actuators with shape memory material members are described in U.S. Pat. Nos. 10,960,793; 11,285,844; and U.S. Patent Application Publ. No. 2020/0298732, which are incorporated herein by reference in their entirety.
(52) FIG. **6** is a view of a portion of the chair **100**, showing the upper platform **112** on top of the plurality of actuators **200**. As noted above, the upper platform **112** can be supported by the actuators **200**. In some arrangements, the upper platform **112** can be a plate-like structure. The upper platform **112** can be made of any suitable material, including, for example, metals, alloys, plastics, polymers, acrylic, or wood, just to name a few possibilities. The upper platform **112** can have any suitable size, shape, and/or configuration. In one or more arrangements, the upper platform **112** can be

substantially rectangular.

(53) The upper platform **112** can be operatively connected to the plurality of actuators **200**. Any suitable form of operative connection can be provided. For instance, the upper platform **112** can include a plurality of apertures **113**. Each of the apertures **113** can receive a respective one of the protrusions **246** on the actuators **200**. In this way, the upper platform **112** can be properly located on the actuators **200**. It will be appreciated that, when the actuators **200** are not activated, the upper platform **112** can be substantially horizontal. When the actuators **200** are activated, the upper platform **112** can become non-horizontal. When the actuators **200** are activated, the protrusions **246** can remain within the apertures **113** in the upper platform **112**.

(54) Alternatively or additionally, other forms of operative connection between the upper platform **112** and the actuators **200** can be provided. For instance, the upper platform **112** can be operatively connected to the actuators **200** by one or more fasteners, one or more adhesives, one or more forms of mechanical engagement, or any combination thereof.

(55) FIG. **11** shows an example of a system **1100**. The system **1100** can include various elements. Some of the possible elements of the system **1100** are shown in FIG. **11** and will now be described. It will be understood that it is not necessary for the system **1100** to have all of the elements shown in FIG. **11** or described herein. The system **1100** can have any combination of the various elements shown in FIG. **11**. Further, the system **1100** can have additional elements to those shown in FIG. **11**. In some arrangements, the system **1100** may not include one or more of the elements shown in FIG. **11**. Further, while the various elements may be located on or within a chair, it will be understood that one or more of these elements can be located external to the chair. Further, the elements shown may be physically separated by large distances.

(56) The system **1100** can include the chair **100**, one or more processors **1110**, one or more data stores **1120**, one or more sensors **1130**, one or more power sources **1140**, one or more input interfaces **1150**, one or more output interfaces **1155**, one or more visual content devices **1160**, one or more displays **1165**, one or more content analysis modules **1170**, and one or more chair control modules **1180**. Each of these elements will be described in turn below.

(57) As noted above, the system **1100** can include one or more processors **1110**. "Processor" means any component or group of components that are configured to execute any of the processes described herein or any form of instructions to carry out such processes or cause such processes to be performed. The processor(s) **1110** may be implemented with one or more general-purpose and/or one or more special-purpose processors. Examples of suitable processors include microprocessors, microcontrollers, DSP processors, and other circuitry that can execute software. Further examples of suitable processors include, but are not limited to, a central processing unit (CPU), an array processor, a vector processor, a digital signal processor (DSP), a field-programmable gate array (FPGA), a programmable logic array (PLA), an application specific integrated circuit (ASIC), programmable logic circuitry, and a controller. The processor(s) **1110** can include at least one hardware circuit (e.g., an integrated circuit) configured to carry out instructions contained in program code. In arrangements in which there is a plurality of processors **1110**, such processors can work independently from each other, or one or more processors can work in combination with each other.

(58) The system **1100** can include one or more data stores **1120** for storing one or more types of data. The data store(s) **1120** can include volatile and/or non-volatile memory. Examples of suitable data stores **1120** include RAM (Random Access Memory), flash memory, ROM (Read Only Memory), PROM (Programmable Read-Only Memory), EPROM (Erasable Programmable Read-Only Memory), EEPROM (Electrically Erasable Programmable Read-Only Memory), registers, magnetic disks, optical disks, hard drives, or any other suitable storage medium, or any combination thereof. The data store(s) **1120** can be a component of the processor(s) **1110**, or the data store(s) **1120** can be operatively connected to the processor(s) **1110** for use thereby. The term "operatively connected," as used throughout this description, can include direct or indirect connections, including connections

without direct physical contact.
(59) In some arrangements, the data stores **1120** can include one or more actuation profiles **1122**. The actuation profile(s) **1122** can be predefined patterns of activation and deactivation of one or more of the actuators **200** to achieve a desired movement of the chair **100**. Examples of the actuation profile(s) **1122** can include tilting forward, tilting backward, tilting right, tilting left, a front-back rocking, a left-right rocking, up, down, vibration, or any combination thereof. The actuation profile(s) **1122** can be for any period of time. In some instances, the actuation profile(s) **1122** can be for a brief moment.
(60) The system **1100** can use the actuation profile(s) **1122** to actuate the actuators **200** without having to determine in real-time which of the actuators **200** would achieve a desired movement of the chair **100**. It should be noted that the actuation profile(s) **1122** can take into account one or more characteristics of an occupant of the chair **100**. For instance, the activation and deactivation of the actuators **200** can be varied based on one or more characteristics of an occupant of the chair **100**, such as a weight of the chair occupant. If the person is heavier than a predefined base weight or weight range, then the activation and deactivation of the actuators **200** can be performed with a greater degree of force. In contrast, if the chair occupant is lighter than a predefined weight level or weight range, then the activation and deactivation of the actuators **200** can be performed with a lesser degree of force.
(61) The system **1100** can include one or more sensors **1130**. “Sensor” means any device, component and/or system that can detect, determine, assess, monitor, measure, quantify, acquire, and/or sense something. The one or more sensors can detect, determine, assess, monitor, measure, quantify, acquire, and/or sense in real-time. As used herein, the term “real-time” means a level of processing responsiveness that a user or system senses as sufficiently immediate for a particular process or determination to be made, or that enables the processor to keep up with some external process.
(62) In arrangements in which the system **1100** includes a plurality of sensors **1130**, the sensors can work independently from each other. Alternatively, two or more of the sensors can work in combination with each other. In such case, the two or more sensors can form a sensor network. The sensor(s) **1130** can be operatively connected to the processor(s) **1110**, the data store(s) **1120**, and/or other elements of the system **1100** (including any of the elements shown in FIG. **1**).
(63) The sensor(s) **1130** can include any suitable type of sensor. Various examples of different types of sensors will be described herein. However, it will be understood that the embodiments are not limited to the particular sensors described.
(64) The sensor(s) **1130** can include one or more chair occupant sensors **1132**. In some arrangements, the chair occupant sensor(s) **1132** can include weight sensors. The weight sensors can be any suitable sensor, now known or later developed.
(65) In some arrangements, the chair occupant sensor(s) **1132** can include one or more gaze sensors. The gaze sensor(s) can be any suitable sensor, now known or later developed. In one or more arrangements, the gaze sensor(s) can include one or cameras, one or more eye sensors, one or more head sensors, one or more face sensors, one or more eye movement sensors, one or more eye tracking sensors, one or more eye position sensors, one or more eye orientation sensors, one or more head movement sensors, one or more head tracking sensors, one or more head position sensors, one or more head orientation sensors, and/or one or more gaze tracking sensors, just to name a few possibilities. The gaze sensor(s) and/or the processor(s) **1110** can be configured to determine the line of sight of the chair occupant, for example, the direction in which the chair occupant is looking. In some arrangements, the gaze sensor(s) can be integrated into the display(s) **1165** and/or the device in which the display(s) **1165** are integrated. In some arrangements, the gaze sensor(s) can contain optical components that can move (e.g., rotate and/or translate) to discern eye angles, head angles, eye position, head position, and/or eyelid position.
(66) As noted above, the system **1100** can include one or more power sources **1140**. The power source(s) **1140** can be any power source capable of and/or configured to energize the shape memory

material members **280** of the actuators **200**. For example, the power source(s) **1140** can include one or more batteries, one or more fuel cells, one or more generators, one or more alternators, one or more solar cells, and combinations thereof.

(67) The system **1100** can include one or more input interfaces **1150**. An “input interface” includes any device, component, system, element or arrangement or groups thereof that enable information/data to be entered into a machine. The input interface(s) **1150** can receive an input from a chair occupant. Any suitable input interface **1150** can be used, including, for example, a keypad, display, touch screen, multi-touch screen, button, joystick, mouse, trackball, microphone and/or combinations thereof.

(68) The system **1100** can include one or more output interfaces **1155**. An “output interface” includes any device, component, system, element or arrangement or groups thereof that enable information/data to be presented to a chair occupant. The output interface(s) **1155** can present information/data to a chair occupant. The output interface(s) **1155** can include a display, an earphone, and/or speaker. Some components of the system **1100** may serve as both a component of the input interface(s) **1150** and a component of the output interface(s) **1155**.

(69) The system **1100** can include one or more displays **1165**. The display(s) **1165** can be any suitable type of display, now known or later developed. The display(s) **1165** can be configured to present visual content thereon. In some arrangements, the display can be a monitor, a television, a laptop, a tablet computer, a smartphone, or other device that includes a display. In some arrangements, the display(s) **1165** can be formed by a projector projecting visual content onto a surface. In some arrangements, the display(s) **1165** can be part of a head mounted display. As an example, the head mounted display can be an extended reality (XR) headset. The XR headset can be any type of XR headset, now known or later developed. Examples of XR headsets include augmented reality (AR), mixed reality (MR), and virtual reality (VR) headsets.

(70) The system **1100** can include one or more visual content devices **1160**. The visual content devices **1160** can be any suitable device that can present or cause to be presented visual content. The visual content device(s) **1160** can be any type of visual content device, now known or later developed. In some arrangements, the visual content devices **1160** can be a separate device operatively connected to the display(s) **1165**. Non-limiting examples of such visual content devices can include gaming systems, Blu ray players, DVD players, an online or cloud streaming service, or plug and play devices, just to name a few possibilities. In some arrangements, the visual content device(s) **1160** and the display(s) **1165** can be integrated into the same device, such as a laptop.

(71) The visual content presented by the visual content device(s) **1160** can be interactive, such as in a video game. One or more input devices can be operatively connected to the visual content device(s) **1160** to allow a user to interact with the visual content. Examples of the input device(s) can include any types of joystick(s), button(s), keyboard(s), keypad(s), switch(es), pedal(s), foot pedal(s), steering wheel(s), speech recognition, gesture recognition, movement recognition, or eye tracking, now known or later developed. The input device(s) can include any of the input interface(s) **1150** described above. In such case, the visual content device(s) **1160** can be responsive to inputs from the player or content watcher provided by the input devices. In some instances, the visual content presented by the visual content device(s) **1160** can be non-interactive, such as a movie. In such case, the user is not able to provide inputs to affect the movement, point of view, and/or action in the visual content. However, basic visual controls (e.g., on/off, color, brightness, contrast, sharpness, tint, etc.) may be available to the user. In some instances, the visual content device(s) **1160** can be configured to send signals to one or more elements of the system **1100** (e.g., the content analysis module(s) **1170**).

(72) The system **1100** can include one or more modules, at least some of which will be described herein. The modules can be implemented as computer readable program code that, when executed by a processor, implement one or more of the various processes described herein. One or more of the modules can be a component of the processor(s) **1110**, or one or more of the modules can be

executed on and/or distributed among other processing systems to which the processor(s) **1110** is operatively connected. The modules can include instructions (e.g., program logic) executable by one or more processor(s) **1110**. Alternatively or in addition, one or more data stores **1120** may contain such instructions.

(73) In one or more arrangements, the modules described herein can include artificial or computational intelligence elements, e.g., neural network, fuzzy logic, or other machine learning algorithms. Further, in one or more arrangements, the modules can be distributed among a plurality of modules. In one or more arrangements, two or more of the modules described herein can be combined into a single module.

(74) The system **1100** can include one or more content analysis modules **1170**. The content analysis module(s) **1170** can be configured to receive visual content, signals, information, and/or data from the visual content device(s) **1160**. The content analysis module(s) **1170** can be configured to analyze the received visual content, signals, information, and/or data from the visual content device(s) **1160**. In particular, the content analysis module(s) **1170** can be configured to analyze the received visual content, signals, information, and/or data to identify movement within the visual content. The content analysis module(s) **1170** can do so in any suitable manner, now known or later developed. The content analysis module(s) **1170** can incorporate any type of ride simulator or motion simulator technology, now known or later developed.

(75) For instance, the content analysis module(s) **1170** can be configured to analyze the movement of the visual content overall or based on the movement of one or more objects or items in the visual content. In some arrangements, the content analysis module(s) **1170** can be configured to analyze signals, information, or data associated with the visual content indicative of movement. The content analysis module(s) **1170** can include any suitable hardware and/or software to receive and process signals from the visual content device(s) **1160**.

(76) The content analysis module(s) **1170** can be configured to determine a corresponding chair movement. Such determining can be performed in real-time based on the visual content presented on the display(s) **1165**. The corresponding chair movement can be a movement of the seat portion **104**, or the rest of the chair **100** located above the upper platform **112**. The corresponding chair movement can be synchronized with at least a portion of the visual content. For example, if the content analysis module(s) **1170** determines that the visual content includes movement that corresponds to a rightward titling of the chair **100**. As another example, if the content analysis module(s) **1170** determines that the visual content includes moving over rough terrain or train tracks, the content analysis module(s) **1170** can determine that a vibration movement of the chair **100** is the corresponding chair movement.

(77) The content analysis module(s) **1170** can be configured to take into account the point of view of the visual content presented on the display(s) **1165**. For instance, the content analysis module(s) **1170** can assess whether the visual content is presented point of view (POV) style. In such case, the content analysis module(s) **1170** can determine corresponding movements that align with the movement presented on the display(s) **1165**. The content analysis module(s) **1170** can assess whether the visual content is presented from some other point of view. In some instances, the corresponding chair movements may not necessarily align (e.g., be in the same direction or side) as the movement presented on the display(s) **1165**. The content analysis module(s) **1170** can be configured to take into account human physiology processes and responses to motion.

(78) The system **1100** can include one or more chair control modules **1180**. The chair control module(s) **1180** can be configured to receive signals, data, information, and/or other inputs from the content analysis module(s) **1170**. The chair control module(s) **1180** can be configured to analyze these signals, data, information, and/or other inputs. The chair control module(s) **1180** can be configured to select one or more of the plurality of actuators **200** to be activated or deactivated to achieve the corresponding chair movement. In some arrangements, the chair control module(s) **1180** can be configured to select an appropriate one of the actuation profiles **1122** in the data store(s) **1120**

to effectuate the corresponding chair movement. Alternatively or additionally, the chair control module(s) **1180** can be configured to detect user inputs (e.g., commands) provided on the input interface(s) **1150**.

(79) The chair control module(s) **1180** can be configured to cause the selected one or actuators to be activated or deactivated by activating or deactivating the respective shape memory material member(s) **280** associated with the selected actuator(s) **200**. As used herein, "cause" or "causing" means to make, force, compel, direct, command, instruct, and/or enable an event or action to occur or at least be in a state where such event or action may occur, either in a direct or indirect manner. The chair control module(s) **1180** can selectively provide an activation input to the actuator(s) **200** or, more particularly, to the shape memory material member(s) **280** associated with the selected actuator(s) **200**. The chair control module(s) **1180** can selectively permit or prevent the flow of electrical energy from the power source(s) **1140**. The chair control module(s) **1180** can be configured to send control signals or commands over a communication network **1190** to the shape memory material member(s) **280**.

(80) The chair control module(s) **1180** can selectively activate or deactivate the shape memory material member(s) **280** timed to substantially coincide with the visual content. For instance, when the visual content is a car racing game, the chair control module(s) **1180** can selectively activate or deactivate the shape memory material member(s) **280** to coincide with an in-game event like the car turning.

(81) The actuators **200** can be operatively positioned to cause a movement of the chair **100** or any portion thereof. In some arrangements, the actuators **200** can respond to signals received from the visual content device(s) **1160**, to signals from an input device operatively connected to the visual content device(s) **1160**, and/or to signals provided on the input interface(s) **1150**. The actuators **200** can expand and contract in a sequence or manner that supports, for example, the desired simulated motion presented in the visual content during game play or movie or otherwise requested by the chair occupant. The actuators **200** can provide various types of movement, including, but not limited to, upward and downward movement, forward and backward tilting, and or left and right tilting. In some arrangements, the actuators **200** can be configured to provide other movements, including rectilinear forward and rearward movement, rectilinear left and right movement, and/or rotation about a vertical axis. In some arrangements, the actuators **200** can be configured to provide six degrees of freedom (e.g., surge, sway, heave, roll, pitch, and yaw motion). Further, the chair **100** can be configured to provide other tactile motions, such as vibrations, shaking, pulsations, etc.

(82) The various elements of the system **1100** can be communicatively linked to one another or one or more other elements through one or more communication networks **1190**. As used herein, the term "communicatively linked" can include direct or indirect connections through a communication channel, bus, pathway or another component or system. A "communication network" means one or more components designed to transmit and/or receive information from one source to another. The data store(s) **1120** and/or one or more other elements of the system **1100** can include and/or execute suitable communication software, which enables the various elements to communicate with each other through the communication network and perform the functions disclosed herein.

(83) The one or more communication networks **1190** can be implemented as, or include, without limitation, a wide area network (WAN), a local area network (LAN), the Public Switched Telephone Network (PSTN), a wireless network, a mobile network, a Virtual Private Network (VPN), the Internet, a hardwired communication bus, and/or one or more intranets. The communication network further can be implemented as or include one or more wireless networks, whether short range (e.g., a local wireless network built using a Bluetooth or one of the IEEE 802 wireless communication protocols, e.g., 802.11a/b/g/i, 802.15, 802.16, 802.20, Wi-Fi Protected Access (WPA), or WPA2) or long range (e.g., a mobile, cellular, and/or satellite-based wireless network; GSM, TDMA, CDMA, WCDMA networks or the like). The communication network can include wired communication links and/or wireless communication links. The communication network can include any

combination of the above networks and/or other types of networks.

(84) Now that the various potential systems, devices, elements and/or components of the chair **100** and the system **1100** have been described, an example of a method of moving a portion of a chair synchronized with visual content will now be described. The method described may be applicable to the arrangements described above, but it is understood that the methods can be carried out with other suitable systems and arrangements. Moreover, the methods may include other steps that are not shown here, and in fact, the methods are not limited to including every step shown. The blocks that are illustrated here as part of the methods are not limited to the particular chronological order. Indeed, some of the blocks may be performed in a different order than what is shown and/or at least some of the blocks shown can occur simultaneously.

(85) Turning to FIG. **10**, an example of a method **1000** is shown. At block **1010**, visual content can be analyzed to determine a corresponding chair movement. The corresponding chair movement can be synchronized with at least a portion of the visual content. The analyzing can be performed by the content analysis module(s) **1170** and/or the processor(s) **1110**.

(86) The analysis of the visual content can be performed continuously, periodically, or at any suitable point. If the visual content does not include a corresponding chair movement, then the method **1000** can return to block **1010** or to some other block. If a corresponding chair movement is determined, the method **1000** can continue to block **1020**.

(87) At block **1020**, one or more of the plurality of actuators can be selected to achieve the corresponding chair movement. Such selection can be performed by the chair control module(s) **1180** and/or the processors **1110**. The method can continue to block **1030**.

(88) At block **1030**, the selected actuator(s) can be caused to be activated. For instance, an activation input can be caused to be provided to the selected actuator(s). As a result, the selected actuator(s) can be activated, which, in turn, can cause the chair to move according to the corresponding chair movement. Causing the activation input to be provided can be performed by the chair control module(s) **1180** and/or the processor(s) **1110**. For instance, the chair control module(s) **1180** and/or the processor(s) **1110** can cause or allow the flow of electrical energy from the power sources(s) **1140** to the shape memory material member(s) of the selected actuator(s).

(89) The method **1000** can end. Alternatively, the method **1000** can return to block **1010** or some other block.

(90) A non-limiting example of the operation of the arrangements described herein will now be presented in connection to FIGS. **2** and **9**. FIG. **2** shows an example of the chair in a non-activated condition, and FIG. **9** shows an example of the chair in an activated condition. While a person would normally be sitting in the chair, the person is not shown in these drawings for clarity. For purposes of this example, the actuators can be arranged in a substantially rectangular configuration, such as is shown in FIG. **3**.

(91) An occupant of the chair can be playing a video game. The video game can be in the nature of a flight simulator, presented from the viewpoint of the player. As the person plays the game, the aircraft may be operated by the player to tilt to the left. As a result, in the game, the aircraft can tilt to the left and the corresponding view of the display will show such motion. Such motion in the game play can be detected by the content analysis module(s) and/or the processor(s). As a result, the content analysis module(s) and/or the processor(s) can determine that there should be a corresponding chair movement to synchronize with the displayed visual content.

(92) The content analysis module(s) **1170** and/or the processor(s) **1110** can select the appropriate actuator(s) **200** to achieve the corresponding chair movement. In this instance, the content analysis module(s) **1170** and/or the processor(s) **1110** can select the actuator **201** for activation.

(93) The content analysis module(s) **1170** can alert the chair control module(s) **1180** of the selected actuator **201**. The chair control module(s) **1180** can cause an activation input to be provided to the selected actuator **201**. Here, the chair control module(s) **1180** can allow electrical energy from the power source(s) **1140** to be supplied to the shape memory material member(s) **280** of the selected

actuator **201**. As a result, the actuator **201** can morph into the activated configuration, as shown in FIG. **9** (see also FIG. **8**). The second dimension **295**, corresponding to the height, of the actuator **201** will be greater than the height of the other actuators **200**. Thus, the chair **100** can be tilted to the left, as is shown in FIG. **9**. The chair control module(s) **1180** can cause such tilting to occur in a synchronized manner with the video game. Thus, the tilting can occur substantially simultaneously with the tilting in the video game. Further, the degree and/or the duration of the tilting can correspond to the degree and/or duration of the tilting in the video game. In some arrangements, the actuator(s) **200** can be configured to provide a lift force of more than 38 Newton (N).

(94) It will be appreciated that arrangements described herein can provide numerous benefits, including one or more of the benefits mentioned herein. For example, arrangements described herein can provide an enhanced visual content experience. Arrangements described herein can provide a haptic ‘4-dimensional experience’ to a chair occupant. Arrangements described herein can provide chair movements that are timed with motion in visual content being presented to the person. Arrangements described herein can cause chair movements triggered by a video game or movie being watched. Arrangements described herein can allow for a simpler product. Arrangements described herein do not require electric motors with gears or a pneumatic compressor system.

(95) The flowcharts and block diagrams in the figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various embodiments. In this regard, each block in the flowcharts or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved.

(96) The systems, components and/or processes described above can be realized in hardware or a combination of hardware and software and can be realized in a centralized fashion in one processing system or in a distributed fashion where different elements are spread across several interconnected processing systems. Any kind of processing system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software can be a processing system with computer-usable program code that, when being loaded and executed, controls the processing system such that it carries out the methods described herein. The systems, components and/or processes also can be embedded in a computer-readable storage, such as a computer program product or other data programs storage device, readable by a machine, tangibly embodying a program of instructions executable by the machine to perform methods and processes described herein. These elements also can be embedded in an application product which comprises all the features enabling the implementation of the methods described herein and, which when loaded in a processing system, is able to carry out these methods.

(97) The terms “a” and “an,” as used herein, are defined as one or more than one. The term “plurality,” as used herein, is defined as two or more than two. The term “another,” as used herein, is defined as at least a second or more. The terms “including” and/or “having,” as used herein, are defined as comprising (i.e., open language). The term “or” is intended to mean an inclusive “or” rather than an exclusive “or.” The phrase “at least one of . . . and . . . ” as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. As an example, the phrase “at least one of A, B and C” includes A only, B only, C only, or any combination thereof (e.g., AB, AC, BC, or ABC). As used herein, the term “substantially” or “about” includes exactly the term it modifies and slight variations therefrom. Thus, the term “substantially parallel” means exactly parallel and slight variations therefrom. “Slight variations therefrom” can include within 15 degrees/percent/units or less, within 14 degrees/percent/units or less, within 13 degrees/percent/units or less, within 12 degrees/percent/units or less, within 11 degrees/percent/units

or less, within 10 degrees/percent/units or less, within 9 degrees/percent/units or less, within 8 degrees/percent/units or less, within 7 degrees/percent/units or less, within 6 degrees/percent/units or less, within 5 degrees/percent/units or less, within 4 degrees/percent/units or less, within 3 degrees/percent/units or less, within 2 degrees/percent/units or less, or within 1 degree/percent/unit or less. In some instances, “substantially” can include being within normal manufacturing tolerances.
(98) Aspects herein can be embodied in other forms without departing from the spirit or essential attributes thereof. Accordingly, reference should be made to the following claims, rather than to the foregoing specification, as indicating the scope hereof.

Claims

1. A chair, comprising: a platform; a seat portion supported on the platform; and actuators operatively connected to the platform, each actuator including a shape memory material member, each actuator being configured such that, when an activation input is provided to the shape memory material member, the shape memory material member contracts to cause the actuator to morph into an activated configuration in which a height of the actuator increases, the actuators being operatively positioned to cause a movement of the entire seat portion by engaging the platform when selectively activated, each actuator including a rib on an inner side thereof.
2. The chair of claim 1, wherein the actuators are arranged in a substantially rectangular pattern.
3. The chair of claim 1, wherein the actuators are arranged in an offsetting substantially parallel pattern.
4. The chair of claim 1, wherein the actuators are arranged in a substantially radial pattern.
5. The chair of claim 1, wherein the shape memory material member is a shape memory alloy wire.
6. The chair of claim 1, wherein each actuator includes: a first endcap; a second endcap positioned opposite the first endcap, wherein the shape memory material member is operatively connected to the first endcap and the second endcap; a first outer member, the first outer member being bowed, the first outer member including a first end and a second end, the first end being operatively connected to the first endcap and the second end being operatively connected to the second endcap; and a second outer member, the second outer member being bowed, the second outer member including a first end and a second end, the first end being operatively connected to the first endcap and the second end being operatively connected to the second endcap, wherein the first and second outer members are made of a flexible material and are arranged on opposite sides of the shape memory material member, the first outer member is located above the second outer member.
7. The chair of claim 6, wherein the platform is supported on the actuators, wherein the platform includes apertures, wherein each of the apertures receives a protrusion of a respective one of the actuators, and wherein the protrusion extends from the first outer member.
8. The chair of claim 6, wherein the actuator includes a base, and wherein the base is operatively connected to the second outer member.
9. The chair of claim 1, wherein the chair is a gaming chair.
10. A system, comprising: a chair including a platform and a seat portion supported on the platform; actuators operatively connected to the platform, each actuator including a shape memory material member, each actuator being configured such that, when an activation input is provided to the shape memory material member, the shape memory material contracts to cause the actuator to morph into an activated configuration in which a height of the actuator increases, the actuators being selectively actuatable and operatively positioned to cause a movement of the entire seat portion by engaging the platform, each actuator including a rib on an inner side thereof; and a processor configured to selectively activate one or more of the actuators by causing the activation input to be provided to the shape memory material member of at least one of the actuators.
11. The system of claim 10, further including: a display operatively connected to the processor, the display being configured to present visual content thereon.

12. The system of claim 11, wherein the processor is further configured to: analyze visual content to determine a corresponding chair movement, the corresponding chair movement being synchronized with at least a portion of the visual content; select one or more of the actuators to achieve the corresponding chair movement; and causing an activation input to be provided to the selected one or more of the actuators, whereby the selected one or more of the actuators are activated to cause the seat portion to move according to the corresponding chair movement.
13. The system of claim 10, further including: a power source operatively connected to supply electrical energy to the shape memory material member of each actuator, wherein the processor is operatively connected to the power source, wherein the processor is configured to selectively control a supply of electrical energy to the shape memory material member.
14. The system of claim 10, wherein the actuators are arranged in one of: a substantially rectangular pattern, an offsetting substantially parallel pattern, and a substantially radial pattern.
15. The system of claim 10, wherein the shape memory material member is a shape memory alloy wire.
16. The system of claim 10, wherein each actuator includes: a first endcap; a second endcap positioned opposite the first endcap, wherein the shape memory material member is operatively connected to the first endcap and the second endcap; a first outer member, the first outer member being bowed, the first outer member including a first end and a second end, the first end being operatively connected to the first endcap and the second end being operatively connected to the second endcap; and a second outer member, the second outer member being bowed, the second outer member including a first end and a second end, the first end being operatively connected to the first endcap and the second end being operatively connected to the second endcap, wherein the first and second outer members are made of a flexible material and are arranged on opposite sides of the shape memory material member, the first outer member is located above the second outer member.
17. The system of claim 10, wherein the chair is a gaming chair.
18. A method of moving a portion of a chair synchronized with visual content, the chair including a platform, a seat portion supported on the platform, and actuators operatively connected to the platform, the method comprising: analyzing visual content to determine a corresponding chair movement, the corresponding chair movement being synchronized with at least a portion of the visual content; selecting one or more of the actuators to achieve the corresponding chair movement; and causing an activation input to be provided to the selected one or more of the actuators, whereby the selected one or more of the actuators are activated to cause the entire seat portion to move according to the corresponding chair movement, each actuator including a shape memory material member, each actuator being configured such that, when an activation input is provided to the shape memory material member, the shape memory material member contracts to cause the actuator to morph into an activated configuration in which a height of the actuator increases, the actuators being operatively positioned to cause a movement of the entire seat portion by engaging the platform when selectively activated, each actuator including a rib on an inner side thereof.
19. The method of claim 18, wherein causing the activation input to be provided to the selected one or more of the actuators includes causing electrical energy from a power source to be supplied to the shape memory material member.
20. The method of claim 18, further including: discontinuing the activation input to the selected one or more of the actuators.
21. A system, comprising: a chair including a platform including apertures and a seat portion supported on the platform; actuators operatively connected to the platform, each actuator including a shape memory material member configured such that, responsive to receiving an activation input, the shape memory material contracts to cause the actuator to morph into an activated configuration in which a height of the actuator increases, the actuators being selectively actuatable and operatively positioned to cause a movement of the entire seat portion by engaging the platform, a protrusion extending from an outer surface of each actuator, each protrusion being received in a respective one

of the apertures; and a processor configured to: analyze visual content on a display to determine a corresponding chair movement synchronized with at least a portion of the visual content; select one or more of the actuators to achieve the corresponding chair movement; and causing an activation input to be provided to the selected one or more of the actuators to cause the seat portion to move according to the corresponding chair movement including tilting, rocking, moving up, or moving down.

22. The method of claim 18, wherein the corresponding chair movement includes tilting, rocking, moving up, or moving down.

23. The system of claim 12, wherein the corresponding chair movement includes tilting, rocking, moving up, or moving down.

24. The system of claim 10, wherein the platform includes apertures, wherein each of the apertures receives a protrusion of a respective one of the actuators, and wherein the protrusion extends from an outer surface of the actuator.