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SMART ADJUSTABLE BED SYSTEM

Abstract

A smart adjustable bed system combines an adjustable bed, a smart hub, a server, and smart devices to provide a system for controlling the raising and lowering of the adjustable bed. The smart hub acts as a gateway interconnecting the smart adjustable bed and a remote server capable of powerful voice recognition and artificial intelligence at a shared price. The system includes methods of using the system to allow an additional smart device such as a tablet computer to act as a remote control for the smart adjustable bed. The system further enables voice controls to be used to raise and lower the adjustable bed. Lastly, the voice recognition of the smart hub can be used to detect snoring and to send a signal to the adjustable bed to raise the bed to a position until the user reaches a position where snoring stops.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of prior application U.S. patent application Ser. No. 17/815,942 filed on Jul. 28, 2022 which is a continuation of U.S. patent application Ser. No. 17/578,104 filed on Jan. 18, 2022 which is a continuation of U.S. patent Ser. No. 15/986,806, filed May 22, 2018, which claims the benefit of U.S. Provisional Application No. 62/509,709, filed May 22, 2017, both of which are hereby incorporated by reference.

PRIOR ART
[0002] The invention relates to adjustable beds and voice activated smart devices.
BACKGROUND OF THE INVENTION
[0003] Adjustable beds are beds with section that are raised and lowered by motors to change the sleeping position of users.
[0004] A wired remote can be connected to the motor. The wired remote is used to signal the motors to raise or lower sections of the bed.
[0005] Adjustable beds can include a computer that can control the motors of the adjustable bed to provide preset positions to the user.
[0006] An adjustable bed with a wired remote exists that allows a first user to adjust the sleeping position of a second user so that the first user can stop the second user from snoring.
SUMMARY OF THE INVENTION
[0007] An object of the invention is to provide a smart adjustable bed that overcomes the disadvantages of the devices and methods of this general type and of the prior art.
[0008] With the foregoing and other objects in view there is provided, in accordance with the invention, a smart adjustable bed. The smart adjustable bed includes a motor for raising and lowering a mattress on the bed. The motor is connected to a computer that receives signals and controls the motor. The computer is connected to a receiver that can receive messages from a device cloud to raise or lower the bed.
[0009] With the foregoing and other objects in view there is provided, in accordance with the invention, a smart motion furniture. Motion furniture includes sofas, chairs, and recliners. The smart adjustable furniture includes a motor for reconfiguring the furniture and/or moving a person using the furniture. The motor is connected to a computer that receives signals and controls the motor. The computer is connected to a receiver that can receive messages from a device cloud to move the motion furniture.
[0010] The invention includes a smart hub such as those sold under the trade names ALEXA, ECHO, GOOGLE HOME, and SMARTTHINGS. The smart hub is a gateway or home controller. The smart hub allows users to control, automate, and monitor their home environment via voice, signal, or mobile device. The smart hub can be configured to fit each user's needs.
[0011] The smart hub can connect to a home's internet router and can be compatible with communication protocols such as ZigBee, Z-Wave, and IP-accessible devices. The smart hub serves to connect sensors and devices to one another and to the cloud.
[0012] The smart hub can interact with cloud-based voice interaction systems. The smart hub can control other the smart adjustable bed by using voice commands.
[0013] The smart hub can be configured to listen for snoring and then send a signal to raise a sleeper's bed, which in turn prevents snoring. The listening function can be initiated by giving the

smart hub a voice command.
[0014] Other features that are considered as characteristic for the invention are set forth in the appended claims.
[0015] The construction and method of operation of the invention and additional objects and advantages of the invention is best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

Description

BRIEF DESCRIPTION OF DRAWINGS
[0016] FIG. **1** is a schematic of an adjustable bed smart device according to the invention.
[0017] FIG. **2** is a bottom view of smart adjustable bed according to the invention.
[0018] FIG. **3** is a bottom perspective view of the smart adjustable bed shown in FIG. **2**.
[0019] FIG. **4** is a top perspective view of the smart adjustable bed shown in FIG. **2**.
[0020] FIG. **5** is a schematic view of the smart adjustable bed system.
DETAILED DESCRIPTION OF THE INVENTION
[0021] The following describes the parts of a smart adjustable-bed system and a method for using the adjustable bed smart device to raise and lower a bed.
[0022] A customer **11** is the person interacting with a smart hub **12** and the owner of the cloud-enabled smart adjustable bed **19**. The customer **11** issues voice commands that are recorded by a microphone in the smart hub **12**.
[0023] The smart adjustable-bed system includes the following parts.
[0024] The smart hub API **14** is a cloud-hosted computer service that understands the voice commands recorded by and received from the smart hub **12** and converts the voice commands to directives (JSON messages) that are sent to smart home script API **14**.
[0025] A hosted script adapter **16** receives directives from the smart home script API **14**. The script adapter **16** is a cloud-based computer service that hosts the smart home script code.
[0026] A smart home script is code and configuration that interpret directives and sends messages to a device cloud **18**.
[0027] A device cloud **18** is the cloud environment provided by the bed manufacturer that controls and manages the customer's cloud-enabled smart adjustable bed.
[0028] The following example demonstrates how a customer **11** raises his or her adjustable smart bed **30**.
[0029] In step 1, the customer **11** who has previously added the bed **19** to the customer's device cloud **18** says, “Smart hub, raise bed” to the customer's smart hub **12**.
[0030] In step 2, the smart hub **12** hears this instruction and sends the instruction to the smart hub service **13** for interpretation.
[0031] In step 3, the smart hub script API **14** interprets the action as “raise” and the device name as “bed”. The smart hub script API **14** composes a message to send to the script adapter **14** that controls the bed **19**. This message is called a directive.
[0032] The directive includes: the action (raise), the device identifier (an ID representing the bed **19** that the customer named “bed”), and information authenticating the customer **11**.
[0033] In step 4, the script adapter **16** receives and parses the request for the action, the device identifier, and authentication details. The script adapter **16** uses this information to communicate with the device cloud **18**. The script adapter **16** generates a message to the customer's device cloud **18**, and tells the adjustable bed **19** to raise.
[0034] In step 5, the device cloud **18** gets the message and the smart adjustable bed **19** raises.
[0035] In a step that is not shown, the script adapter **16** sends a response back to the smart home script API **14** indicating whether the script adapter **16** successfully raised the smart adjustable bed

19. The smart hub **12** uses this response to determine the appropriate response to the customer **11**. For example, the smart hub **12** might say, “OK” to indicate the requested action is complete.
[0036] A developer **15** is a writer of a smart home script. The developer **15** follows protocols set by the smart hub service **13**. The smart hub service **13** knows how to interpret the customer's speech and generate messages to send to smart home scripts. Generally, smart home script development falls into two categories. First, developers **15** who represent the smart adjustable bed **19** manufacturer that want to enable customers **11** to interact with the smart adjustable bed **19** using the voice of the customer. Second, developers **15** who want to create a script for the smart adjustable bed, either for their own private use or general public use. Certification is required for public use.
[0037] In a second preferred embodiment, the customer **11** who has previously added the bed **19** to the customer's device cloud **18** says, “Smart hub, stop snoring” to the customer's smart hub **12**.
[0038] In step 2, the smart hub **12** hears this instruction and sends the instruction to the smart hub service **13** for interpretation.
[0039] In step 3, first, the smart hub script API **14** interprets the action as “listen for snoring” and the device name as “smart hub” The smart hub script API **14** composes a message to send to the script adapter **14** that controls the smart hub **12**. This message is called a directive. The directive includes: the action (listen for snoring), the device identifier (an ID representing the smart hub **12** to which the customer **11** gave the instruction), and information authenticating the customer **11**. Next, if the smart hub **12** hears snoring, the smart hub script API **14** composes a message to send to the script adapter **14** that controls the smart adjustable bed **19**. This directive includes the following information: the action (raise), the device identifier (an ID representing the smart adjustable bed **19** that is to raise).
[0040] In step 4, the script adapter **16** receives and parses the request for the action, the device identifier, and authentication details. The script adapter **16** uses this information to communicate with the device cloud **18**. The script adapter **16** generates a message to the customer's device cloud **18**, and tells the adjustable bed **19** to raise.
[0041] In step 5, the device cloud **18** gets the message and the smart adjustable bed **19** raises.
[0042] In an embodiment that is not shown, a smart device such as a tablet or smart phone can be used send instructions to raise or lower the smart adjustable bed to the smart hub **12**. In addition, the microphone in the smart phone or tablet can be used to detect when the customer **11** is snoring.
[0043] FIGS. **2-4** show a preferred embodiment of a smart adjustable bed. The smart adjustable bed **19** includes a bedframe **31**. The bedframe **31** is divided into a head frame piece **32** and a foot frame piece **33**. Six legs **34** are connected to the bedframe **31**. The head frame piece **32** moves relative to the foot head piece **33** to move the smart adjustable bed from a flat position as shown in FIG. **3** to an inclined position as shown in FIG. **4**.
[0044] FIGS. **2-3** show the bottom of the bedframe **31**. A controller **50** is disposed on the bottom of the bedframe **31**. The controller **50** is connected to a head motor **40**. The controller **50** sends an incline signal to the head motor **40** to activate the head motor **40**. The head motor **40** raises the head frame piece **32** from the flat position to the inclined position. The controller **50** sends a decline signal to the head motor **40** to activate the head motor **40**. The head motor **40** lowers the head frame piece **32** after receiving the decline signal. The head motor **40** can be stopped at any time to control the amount of inclination. A sensor connected to the controller **50** detects an amount of inclination of the head frame piece **32**.
[0045] The controller **50** is connected to a foot motor **41**. The controller **50** sends an incline signal to the foot motor **41** to activate the foot motor **41**. The foot motor **41** raises the foot frame piece **33** from the flat position to the inclined position. The controller **50** sends a decline signal to the foot motor **41** to activate the foot motor **41**. The foot motor **41** lowers the foot frame piece **33** after receiving the decline signal. The foot motor **41** can be stopped at any time to control the amount of inclination. A sensor connected to the controller **50** detects an amount of inclination of the foot

frame piece **33**.
[0046] Devices such a USB port **37**, head massage motor **38**, foot massage motor **39**, and LED lights are connected to the controller **50**. The controller **50** sends signals to activate and deactivate the devices.
[0047] FIG. **4** shows retainer bar **35**. The retainer bar **35** prevents a mattress (not shown) from slipping from the bedframe **31**, particularly when the bedframe is in an inclined position as shown in FIG. **4**. The retainer bar **35** connects to the bedframe **31** with quick connect brackets **36**.
[0048] FIG. **5** shows a preferred embodiment of smart adjustable bed system. The smart adjustable bed system includes a smart adjustable bed **30**, a smart hub **12**, a server **70**, and a smart device **80**.
[0049] The smart adjustable bed **30** includes a smart adjustable bedframe **31** as previously described with a mattress disposed on the top of the bedframe **31**. The bedframe **31** includes a motor **40**. When the motor **40** can be operated in two directions: the first to cause the bed to incline and the second to cause the bed to decline. A bus **51** interconnects the motor **40** and the controller **50**. The controller **50** sends an incline signal on the bus **51** to the motor causing the motor to incline the bedframe piece **32**. The controller **50** sends a decline signal on the bus **51** to the motor causing the motor to decline the bedframe piece **32**. The incline signal and decline signal are each preferably binary (i.e., on/off signals). The motor **40** includes a sensor that sends data describing the position of the bedframe (i.e., flat, inclined, 50% inclined) to the controller **50** via the bus **51**.
[0050] The controller **50** includes a wireless transceiver **52** and a controller microprocessor **53**. The controller **50** transceiver sends and receives computer-readable instructions that comply with a device API. An example of a preferred embodiment of a device API is sold under the trade name SMARTTHINGS. The controller transceiver **52** communicates via wireless protocol as ZigBee, Z-Wave, and IP. The controller microprocessor **53** is connected to the controller transceiver **52**. The controller microprocessor **53** receives computer-readable instructions that comply with a device protocol and converts them into the signals that control the motors **40**/**41**.
[0051] The controller microprocessor **53** can generate computer-readable messages that comply with the device protocol that describe the status of the parts of the smart adjustable bed. Particularly, the controller microprocessor **53** is programmed to process signals describing the position of the adjustable bed into computer-readable messages. The controller transceiver **52** transmits the computer-readable message to the smart hub via the wireless device network.
[0052] The preferred embodiment of the smart adjustable bed system includes a smart hub **12**. Preferred embodiments of smart hubs are sold under the trademarks AMAZON ECHO and GOOGLE HOME. The smart hub **12** includes a device transceiver **61** and a server transceiver **63**. A preferred embodiment of the device transceiver **61** is radio frequency transmitter. Preferred embodiments of the server transceiver **63** include wired NICs and wireless NICs. The device transceiver **61** transmits and receives computer-readable instructions according to a device API to and from the controller transceiver **52**. The server transceiver **63** transmits computer-readable instructions according to a server API. The smart hub **12** includes a smart hub microprocessor **62**, which acts as a network gateway interconnecting the device transceiver **61** and the server transceiver **62**. The smart hub microprocessor **62** converts computer-readable instructions and messages to and from the device API and the server API.
[0053] Preferably, the smart hub **12** includes a microphone **64** connected to the smart hub microprocessor **62**. The microphone **64** is placed within listening range of the smart adjustable bed. The microphone **64** is configured to send recorded sounds to the smart hub microprocessor **62**. The smart hub microprocessor **62** converts the recorded sounds to recorded sounds compliant with the server API and transmits the recorded sounds compliant with the server API from the server transceiver **63** to a server **70**. Typically, the server **70** is located remotely from the smart adjustable bed **30** and smart hub **12**.
[0054] The smart adjustable bed system preferably includes a computer server **70**. The computer server **70** includes a NIC **71** to connect it to the server network. The preferred embodiment of the

server network is an IP network such as t h e Internet **90**. The server **70** is programmed to process computer-readable instructions complying with the server API and to send computer-readable instructions complying with the server API to the smart hub **12**.
[0055] Preferably, the server **70** is connected to a computerized database **72**. The database **72** stores data identifying the smart adjustable bed **30**, the smart hub **12**, and the instructions and messages being sent to and from them, and relates them to each other.
[0056] The server **70** can be used to perform voice recognition on voice instructions recorded by the microphone **64** of the smart hub **12**. Likewise, the server **70** can be used to detect snoring in the sounds recorded by the smart hub **12**. In turn, the server **70** generates computer-readable instructions and messages that comply to the server API and transmit them to connected devices such as the smart hub **12**.
[0057] The system preferably includes a smart device **80** which can act as an input/output display for the system. Preferred embodiments of smart devices **80** include smartphones, tablet computer, personal computers, and smartwatches. The smart device **80** has a wireless NIC **81** to connect the smart device **80** to the server **70** preferably by the internet **90** using Wi-Fi or a wireless telephone network. **8**. The smart device **80** can display status information on the position (amount of incline) of the smart adjustable bed **30** that is being relayed from the smart adjustable bed **30** to smart hub **12** to the server **70** and then to the smart device **80**. In addition, the smart device **80** is preferably a remote control for the smart adjustable bed **30** and can transmit signals via the server **70** through the smart hub **12** to the smart adjustable bed **30** that instruct the bed **30** to raise or lower.
[0058] A preferred method of inclining an adjustable bed utilizes the features of the smart adjustable bed system to use a smart device **80** to adjust the inclination of the smart adjustable bed **30**. The first involves transmitting a computer-readable instruction to incline the adjustable bed from a smart device **80** to a server **70**. The computer-readable instruction from said smart device complying with a server API. The next step involves transmitting a computer-readable instruction from the server **70** to a smart hub **12** across a server network. The preferred embodiment of the server network is the Internet. The computer-readable instruction being transmitted from the server complies with the server API. The next step is converting the computer-readable instruction from said server **70** to a computer-readable instruction that is compliant with a device API. The next step is transmitting the computer-readable instruction compliant with the device API to a controller of the smart adjustable bed **30**. The next step is transmitting a signal from the controller to a motor **40** of the smart adjustable bed **30**. The next step is activating the motor **40** after receiving the signal from the control until the smart adjustable bed **30** is in an inclined position.
[0059] The method can include steps that confirm the position of the smart adjustable bed **30** after the motor was activated. The first step is, after transmitting the signal to the motor **40**, transmitting a computer-readable message compliant with the device API to the smart hub **12** over the device network. The computer-readable message includes information that indicates the position (i.e., amount of incline) of the smart adjustable bed **30**. The next step is converting the computer-readable message compliant with the device API to a computer-readable message compliant with the server API with said smart hub **12**. The smart hub microprocessor **62** performs the conversion. The next step is transmitting the computer-readable message compliant with the server API from the smart hub **12** to the server **70** over the server network. The next step is transmitting the computer-readable message compliant with the server API from the server **70** to the smart device **80**. The final step is indicating the smart adjustable bed **30** is in the inclined position on the smart device **80** after receiving the computer-readable message compliant with the server API from the server **70**. This position can be indicated with a pictogram of the smart adjustable bed being displayed on a screen of the smart device **80**.
[0060] Another preferred method of using the smart adjustable bed system is to use voice commands to control the inclination of the smart adjustable bed **30**. The first step of the method is saying a voice command to incline the smart adjustable bed **30** (e.g., “raise the bed”) within

hearing distance of a microphone **64** in a smart hub **12**. The next step is sending the voice command from the microphone **64** to the smart hub microprocessor **62**. The next step is generating with the smart hub microprocessor **62** recorded sounds compliant with a server API from the voice commands received from the microphone **64**. The next step is transmitting the recorded sounds compliant with the server API from said smart hub **12** to a server **70**, which is connected by the Internet. The next step is generating with the server **70** a computer-readable instruction compliant with the server API from the recorded sound compliant with the server API received from the smart hub **12**. The computer-readable instruction will instruct the smart bed **30** to move to an inclined position. The next step is transmitting the computer-readable instruction compliant with the server API from the server **70** to the smart hub **12** across the Internet. The next step is converting with the smart hub microprocessor **62** the computer-readable instruction compliant with the server API to a computer-readable instruction compliant with a device API. The next step is transmitting the computer-readable instruction compliant with the device API from the smart hub **12** to a controller **50** across the device network via a wireless, ZIGBEE, Z-WAVE or the like. The next step is generating with the controller **50** a signal to activate a motor **31** of the adjustable bed **30**. The next step is transmitting the signal from the controller **50** to the motor **31**. The last step is activating the motor after receiving the signal from the controller **50** until the adjustable bed **30** reaches an inclined position.

[0061] A third preferred method of using the smart adjustable bed system provides a way to stop snoring. The first step is positioning a microphone **64** of a smart hub **12** within hearing distance of an adjustable bed **30**. The next step is transmitting sound detected by the microphone to a microprocessor **62** in the smart hub **12**. The next step is generating with the microprocessor **62** recorded sounds compliant with a server API from the sound received from the microphone **64**. The next step is transmitting the recorded sounds compliant with the server API from the smart hub **12** to a remote server **70** on the Internet **90**. The next step is detecting with the server **70** snoring in the recorded sounds compliant with the server API. The next step is generating with the server **70** a computer-readable instruction compliant with the server API after detecting the snoring in the recorded sound compliant with the server API. The computer-readable instruction will instruct the smart bed **30** to move to an inclined position. The next step is transmitting the computer-readable instruction compliant with the server API from the server **70** to the smart hub **12** via the Internet **90**. The next step is converting with the microprocessor **62** of the smart hub **64** the computer-readable instruction compliant with the server API to a computer-readable instruction compliant with a device API. The next step is transmitting said computer-readable instruction compliant with the device API from the smart hub **12** to a controller **50** via the device network. The next step is generating with the controller **50** a signal to activate a motor **40** of the adjustable bed **30**. The next step is transmitting the signal from said controller **50** to the motor **40**, preferably via a bus **51**. The next step is activating the motor **40** after receiving the signal from the controller **50** until the adjustable bed **30** reaches an inclined position.

Claims

1. A method for reporting a position of an adjustable bedframe, which comprises: generating a signal based on a position of said adjustable bedframe; converting said signal to position data, said position data describing said position of said adjustable bedframe; and transmitting said position data in an output signal to said third-party smart hub service, said output signal complying with said third-party server API;

2. The method according to claim 1, which further comprises; attaching at least one sensor to said adjustable bedframe;

3. The method according to claim 2, which further comprises: connecting a microprocessor to said at adjustable bedframe.

4. The method according to claim 1, which further comprises: connecting a transmitter to a microprocessor; transmitting said output signal containing said position data with said transmitter.
5. A smart adjustable bed system comprising: a bedframe having a head frame piece and a foot frame piece, said head frame piece being movable relative to said foot frame piece; at least one motor being connected to said head frame piece, said at least one motor being connected to said foot frame piece, said at least one motor is configured to move said bedframe to different positions, said at least one motor is configured to move said foot frame piece to different positions, and at least one sensor detecting position of said adjustable bed system; a microprocessor being configured to receive an instruction to move said bedframe, said microprocessor receiving a signal from said at least one sensor, wherein said microprocessor receiving said instruction from a third-party smart hub service of said third-party recipient, said instruction complying with a third-party server API of said third-party recipient; and a controller being connected to said microprocessor and to said at least one motor for moving said bedframe, said controller being configured to receive said instruction to move said bedframe wherein upon receipt of said instruction said controller initiates a directive to activate said at least one motor causing movement of said bedframe; and
6. The smart adjustable bed system according to claim 5, wherein said instruction to move said bedframe is based on a voice command.
7. The smart adjustable bed system according to claim 5, wherein upon detection of a snoring event, said instruction initiates movement of said head frame piece.
8. A smart adjustable bed system, comprising: a bedframe having a head frame piece and a foot frame piece, said head frame piece being movable relative to said foot frame piece; at least one motor being connected to said head frame piece, said at least one motor being connected to said foot frame piece, said at least one motor is configured to move said bedframe to different positions, said at least one motor is configured to move said foot frame piece to different positions; and at least one sensor detecting position of said adjustable bed system; and a microprocessor configured to initiate an instruction to move said adjustable bed system into a different position upon detection of a snoring event, said microprocessor receiving said sensor signal from said at least one sensor, generating position data from said signal, and outputting said position data, said position data describing said position of said bedframe, and said position data complying with a third-party server API of a third-party smart hub service;